Most of the dwellings in Bang Chan flanked the canals that stretched away from the temple area. All houses were in sight of one or more other houses, if not standing side by side. Here and there they formed small hamlets where kinsmen tended to live in proximity. Around the houses were kitchen gardens and threshing floors, and behind them, the fields. Bananas grew abundantly; pineapples, mangoes, and other fruits occasionally. The canals were full of water-vegetables, cultivated or wild, while fish were plentiful. Water sources were the rain, kept in large jars; artificial ponds dug near the houses and fed from ground water; and the canals. No wells existed. The large tile roofs of the temple collected a good deal of rain-water which was available to anyone during the hot season when all water ran low.

General Nutritional Level

The population was physically well-formed with few physical deformities evident. There was little obesity or emaciation. The daily diet (cf. Hauck, et al.:passim) consisted of large quantities of rice, with small amounts of fish, meat, vegetables, fruits, spices, and eggs. Food at the not-infrequent festivals was rich in meat, eggs, and sugar. No milk was available except canned imports, and little was used. "Nevertheless, though caloric deficiency ('hollow hunger') was not prominent, over half of a sample of the population inspected medically had one or more signs of malnutrition. Even in a group chosen for research reasons for apparently good nutrition, about one in four had some such sign and in another group, selected for evidence of poor nutrition, two out of three persons had such."[2] The nutritional level in Bang Chan did not always correlate absolutely with economic level, for nutritionally one of the poorest families was found to be one of the best fed because the father did so much fishing and collecting of green canal vegetables. The change-over, some decades ago, from home pounding of rice to steam milling by most families had probably been a major factor in increasing nutritional deficiencies throughout the community.

2. Dr. H.M. Hauck, personal communication, 1959.

105 262 Sweets and fruit were the items most commonly eaten. Fruits were seldom eaten except as snacks.

271 105 The customary beverage with meals was untreated water. Rain water was preferred for drinking, but for 3 or 4 months of the year, water from the canal or fish pond was used.

105 262 Attitudes toward food, and foods considered appropriate for the very young, the old, for the pregnant or nursing woman and for use during illness, are briefly discussed.

105 126 146 Quantitative food intake for 11 families was recorded on a total of 44 survey days distributed throughout the year. Two groups of families, in which individuals were matched so far as possible as to age and sex, were selected on the basis of apparent difference in nutriture. The sample was not stratified with respect to economic conditions, but those in Group B, chosen for apparently better nutriture proved to be, in general, more prosperous than those in Group A, chosen because of signs of poor nutrition.

105 146 Food values were calculated on the basis of published analyses. Conservative nutrient allowances were estimated for residents of Bang Chan. On the average, calories, protein, iron, niacin and ascorbic acid in the diets of persons in Group B approximated or exceeded these allowances. For Group A, this was true for niacin and ascorbic acid only. Average intakes of riboflavin were estimated to be about 1/3 or less of the allowances, and estimates of calcium intake were about 20% of the allowance for Group A and 30% of that for Group B. Vitamin A values of diets for both groups appeared to be low, and thiamine intakes marginal or low. The signs observed among persons in these families were generally those associated with low intakes of thiamine, riboflavin and vitamin A.

Rice contributed about 4/5 of the calories and over half the protein in diets of both groups. Animal foods, chiefly fish, furnished about 2/5 of the protein. Intake of fats and sugar was small. Snacks of fruit contributed about 1/6 of the total ascorbic acid for Group A, and about 1/9 for Group B.

Seasonal variations in food preparation, meal patterns, food costs and caloric and nutrient values of foods eaten are discussed. Higher caloric intake during heavy work seasons was largely accounted for by larger amounts of rice eaten. The highest intake of protein for both groups occurred in the post-harvest season, when fish ponds were drained.

Questions for further study are proposed, and possible approaches to improving food habits and nutritional status in Bang Chan are suggested.

GENERAL DESCRIPTION OF FAMILY FARE IN BANG CHAN

As we turn to a detailed description of the family fare, we should like to point out that starvation was unknown in Bang Chan. Although much room remains for improvement in diet, "hollow hunger" was uncommon. In the few times when disastrous flood destroyed the year's crop, the government was able to provide enough rice so that it need not be rationed. People still ate their fill. Even floods had their advantage: one could fish out the window. That gross caloric undernutrition was rare was borne out by examination of the school children (Hauck, 1956). "On the average . . . Bang Chan children could not be considered as markedly underweight. Few were so thin that one could 'count their ribs' and still fewer would be considered plump by American standards." In a random sample of village households that included about 10% of the population, the heaviest man weighed 69 kg. (151.8 pounds) and the heaviest woman 70 kg. (154 pounds). We noted no more than half a dozen adults who appeared to be "overweight." Most were middle aged or older, and none of them did strenuous field work.

Sources of Food

Home Production, Storage and Preservation

Rice. - Rice is an essential part of any Thai meal. The majority of the rice farmers in Bang Chan had rice for home consumption milled for them at Minburi. In general, they took their own paddy to the mill, and brought the resulting milled rice home, where it was stored in a box or mat-bin. Although, according to a recent survey (Goldsen and Ralis, 1957) nearly a third of the households owned a home rice mill, undermilled or home-pounded rice was not widely used in Bang Chan. Information on this point was obtained for 333 of 336 "kitchen-unit"[1] households in the village. Of these 5 consumed home-milled rice only, 51 used home-milled rice in major part, 78 in minor part, and 199 not at all.

In households where home-milled rice was used, during June enough would be pounded to last until harvest, at which time hands were sore and bleeding from the field work and home pounding was impossible. At the time when data for the present report were being gathered, most families took paddy to the mill when water in the canal was high enough so that it could be transported by boat. If a farmer on a subsidiary

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1. In some large houses, two related family groups lived together but maintained separate kitchens.

canal misjudged his needs for milled rice and ran out, he had to mill his own paddy. Since the main canal was deepened in 1953, year-round transportation of rice by boat has been possible for many more farmers, and this may further decrease the consumption of home-milled rice.

Of 105 households which had and used a home rice mill, 99 used the polishings for feed but no family in Bang Chan used them for human food (Goldsen and Ralis, 1957). One farmer, headman of a hamlet, who lived near the main canal and the road to Minburi but who used home-milled rice, offered as the reason that the polishings were good chicken feed, and if he took rice to Minburi to be milled, the miller would keep the polishings.

As reported by Janlekha (1955) consumption of milled rice in 106 households amounted to about 285 kilograms per capita per year or 780 grams per person per day. Such "household consumption" includes "losses to pests and poultry, daily gifts to priests, contributions to temples and outlays for feasts and rites in undetermined but considerable amounts" (Sharp et al., 1953, pp. 265-266).

Flesh Foods Other than Fish. - The people of Bang Chan had a taste and appreciation for flesh food, but the production and use of meat was certainly inhibited by Buddhist tenets which prohibited the taking of life.[1] Killing of poultry, fish, etc. was tolerated among the relatively young, but was considered unsuitable to the aged who should be preoccupied with living virtuously. People felt, however, that the sin of taking life was condoned if they offered part of an animal to the priests.

Since many villagers were unwilling to slaughter buffaloes even when they become aged and useless, such animals were commonly kept until they died. Animals which had died of old age or disease were not, however, regarded by Thai Buddhists in Bang Chan as unfit for human consumption. Usually they were cut up and given to the priests. When the buffalo belonging to one family (Household 67)[2] participating in the dietary survey died, some of the meat was used fresh for curry, much

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1. Meat such as water buffalo and pork as well as fish was sold by venders. Since meat was relatively expensive and was usually used in small amounts with other foods, it was offered for sale in chunks which no longer resembled the living animal. Seeing such small quantities spared the sensibilities of the Buddhists who were thus removed a step from the killing. Actual butchering was done by Moslems or Chinese who did not object.

2. Households were identified by numbers assigned by lot.

One other aspect of (1)ngaan which should be mentioned
252 in connection with food and health is the opportunity for con-
756 tamination of food. The villagers did not associate sanitation
751 with health, hence the hazards of a community meal which many
[753] persons helped to prepare were many. Two incidents observed the day before an ordination in early April, will illustrate. In the final stage of making Chinese noodles, rice flour paste was extruded through a perforated disk into an enormous pot of boiling water. When done, the product was removed with a fish net, and plunged into the canal to cool, after which women helpers spread it out on banana-leaf covered trays. Dishes were also washed before use in the canal, which was then too low for boats. Since, however, many people drank untreated canal water at this season (see p. 28), the added hazards for the participants caused by these procedures may have been slight.

262 In summary, food plays a major role in ceremonies and
792 festivities, which are concentrated in the 3 months' dry season. Proposals for dietary improvement in Bang Chan must take into account not only the possible effects of the (1)ngaan season on the total nutrient intake, and on opportunity for exposure to contaminated food, but also the importance of these affairs from the standpoint of merit and prestige, and the relatively great financial burdens which villagers therefore undertake because of them.

QUANTITATIVE DIETARY STUDY: FOODS EATEN AND ESTIMATED NUTRIENT INTAKE OF SELECTED FAMILIES IN BANG CHAN

Procedure

121 Selection of the Sample
125
146 Medical inspection designed primarily to discover possible signs of nutritional deficiency was carried out in advance of the family dietary study. The suggestion of Grant (1948) that matched groups, of contrasting economic or other status be studied, appeared to be appropriate to the situation in Bang Chan. Our hope was to be able to select from the random sample of families given medical inspection (Hauck, 1956) a group of families (A) in each of which several members had clinical signs which might be evidence of malnutrition, and a group of families similar in age and sex distribution (B) in each of which the members were largely or wholly free from such signs.

125 When the medical inspection of the random sample was
146 complete, however, too few of the families were found to meet our criteria for inclusion in Group A, i.e. the group of apparently less well nourished families. Additional families for

125 this group were located by checking the list of school chil-
146 dren, all of whom had been examined, for instances in which 2 or 3 children in one family had signs possibly indicative of malnutrition. The remaining members of their families were then examined. Families appropriate for Group B were chosen from those in the random sample.

Note that the groups for inclusion in the weighed dietary study were selected on the basis of apparently contrasting nutritive status. They did not represent a random sample of village families, although 7 of the 11 families included in the dietary study were in the random sample chosen for the medical inspection. In the absence of recommended dietary allowances for Thai, study of food intakes of two such groups seemed likely to yield more useful information than would be obtained from a dietary survey of a random sample of the population.

The groups chosen for study included 11 households, 6 in Group A and 5 in Group B, with 30 members in each group, paired so far as possible according to age and sex. When the survey was begun, however, 2 additional members were found in the households in Group A and 7 additional members in Group B. These were relatives and hired helpers who remained in the households throughout the survey year. The field worker who carried out the dietary study rearranged the matching plan somewhat, so that 32 reasonably well matched pairs were obtained (Table 6). In planning this rearrangement, the observer had in mind pairing persons of similar size, so far as possible, in addition to pairing by sex and approximate age.

Estimation of Caloric and Nutrient Allowances

Because of the 5 additional unmatched persons in Group B, males aged 23, 15 and 4 years, and females aged 79 and 82, some means was sought of checking the validity of comparing calculated per capita food and nutrient intakes for the two groups. By selecting matched groups differing in apparent nutriture, we had hoped to avoid comparing calculated nutrient intakes with an arbitrary standard, but comparison of estimated per capita nutrient needs of the two groups appeared to provide one means of checking the probable comparability of our groups, even though their members were not all matched as originally planned. No nutrient allowances had been proposed for Thai, however, so Nicholls' (1951, p. 315) allowances for people in the tropics were modified by taking into account information in Recommended Dietary Allowances of the National Research Council, Food and Nutrition Board (1953) and FAO recommendations concerning caloric requirements (FAO Committee on Caloric Requirements, 1950). The resulting basic table of allowances for Thai people in Bang Chan (Table 16, p. 104) is conservative, and probably represents something like a

[Text continues on page 57 --- Analyst]

125 nutritional floor for this population, beneath which maintenance of health cannot be assumed. From this table, allowances were estimated for persons of each age and sex, for Groups A and B (Table 17, p. 105). Estimates were made for each quarterly period or Round, during which each family was visited once, and these were averaged to obtain mean per capita allowances for each group for the year (Table 18, p. 108). In each group, one woman was in late pregnancy during the third Round, and a new infant had been added to each group in the fourth Round. Since young infants in Bang Chan are given little more than mother's milk, allowances for the fourth Round were adjusted to account for an additional nursing mother, but not for the infant itself. Differences in estimated per capita allowances for Groups A and B were trivial (Table 18, p. 108), hence we felt justified in comparing the estimated food and nutrient intakes of the groups as originally planned, even though Group B contained 5 persons not matched with persons in Group A.

Method of Collecting Data

124 The procedures we planned to use were first pretested
125 in several households to give the observer experience and to be sure that the method would actually work under conditions in Bang Chan. Following the pretest, each family chosen was told in a preliminary interview, what the observer wished to do, and in what ways family members would be expected to cooperate (Appendix C, p. 109). All families that were asked to participate in the study consented. They were not notified in advance just when the observer would visit. Observations on each family included food intake for a 24-hour period, 4 times during the year: twice during the rainy season, and once each during the cool and the hot, dry seasons.

Survey days were planned so as to avoid special festivals when food preparation might be unusual. Six of the 44 survey days fell on (1)wan (4)phra, the weekly holy day. The families visited on (1)wan (4)phra did not, however, take food to the temple on those days, hence food preparation and consumption was probably not unusual.

Alternate visits to the families in Groups A and B were planned so that seasonal variations in food supply would not be apt to account for any observed differences in food intake. Again, our plan could not be fully carried out. Occurrence of cooperative transplanting and other interfering circumstances made some modifications in schedule necessary. Since the objective was to learn about the usual family food intake, the study was not carried on when several members of the family were away from home, or when the participating family was preparing to feed neighbors who were helping with farm work. In such a case, the field worker would go to the nearest

per day were calculated for Groups A and B by Round and for all survey days (24 days for 6 families in Group A, 20 for 5 families in Group B). The total amounts eaten per capita per day, of various food groups, and the relative nutrient contributions of these groups were also calculated.

Results and Discussion

Socio-Economic Situation of the Two Groups of Families Studied

General Socio-Economic Conditions. - In the course of the study the observers were able to obtain information, both by inquiry and direct observation, on the economic condition of the families. Questions about land holdings, the amount of land farmed, number of working buffaloes owned, number of priests to whom food was given and sources of income, were asked during the second Round of the survey, after the participants were acquainted with both the field workers and the procedures. As raw foods were weighed, the observer asked if they were home grown or prepared, and recorded the cost of foods purchased.

Although our sample was not stratified with respect to economic condition, the families in Group B, i.e. those chosen for apparently better nutriture, proved to be more prosperous than those in Group A (Table 8). With the exception of Household 222 in Group A, rice production was the main source of income. Families in Group B had a greater capital investment in land and buffalo, and worked more land, having more productive hands per family available. Farm work was finished sooner, hence members could begin intensive fishing earlier than in Group A. All children aged 13-15, in both groups, did light farm work and/or selling in market, cooking, baby tending and care of buffalo. In all households, husband or wife or both came from old families in the community, hence had extensive kinship relations.

From the viewpoint of parents, the "peak of life" was the time when children were no longer dependent, but productive, unmarried workers whose earnings stayed within the family. Household 16 was such a family, forward looking, progressive and optimistic. The successful and respected couple in Household 25 would enter this "peak of life" situation in a few years. Household 20 included a widower and his almost grown daughter living with his younger brother and the latter's family, and their senile mother, in harmonious cooperation. Ample land, housing, buffalo and farm labor combined with other skills, made for good living. In Household 21, two strong, unmarried sons still lived with their elderly parents. The only poor family, of low status, in Group B, was Household 23. By great industry, especially in

[Text continues on page 63 --- Analyst]

235 Eggs and poultry. - Every household which took part in the survey raised chickens, and 3 of the 11 households had ducks also. In both groups of families, most of the eggs produced were sold. Home consumption of eggs on survey days was small.

228 Fish. - Each family studied had a fish pool. One family only, Household 25 in Group B raised tilapia. They began tilapia culture during the third round of the study, too late to ascertain how this might affect fish consumption in the family.

251 Preservation of Foods at Home. - Home food preservation was practiced to a very limited extent only, fish products being the principal ones produced.

Dried fish. - Families in both groups salted and dried fish throughout the year whenever they were available in excess of immediate needs.

Fermented fish. - In 10 of the 11 households, fermented fish was prepared. The 6 families in Group A had prepared a total of 30 kg., and 4 of the 5 families in Group B, a total of 29 kg. The largest amount prepared in one household, for one year was 10 kg.

Shrimp paste. - Because shrimp were caught in insufficient quantity, shrimp paste was prepared by only 6 of the 11 families. Four families in Group A prepared a total of 26 kg., and 2 families in Group B prepared a total of 7 kg. These amounts were insufficient for their needs.

Fishsoy. - One family only, in Group A, prepared fishsoy. All others in both groups purchased this product.

Buffalo meat. - During the survey year, the buffalo belonging to one family died. Some of the meat was used fresh for curry, and the remainder was salted, dried and sold.

Comparison of Caloric and Nutrient Intakes of the Two Groups With Each Other and With the Estimated Allowances.

128 146 In Table 11, the estimated calories and nutrients available to the two groups of families, are shown together with the estimated allowances.

146 On the average, the number of calories, and amounts of protein, iron, niacin and ascorbic acid in the diets of persons in Group B, the apparently better nourished group, approximated or exceeded the conservative allowances. For Group A, this was true for niacin and ascorbic acid only, the calories being 11%, protein 15% and iron 21% below the allowances.

2: Hauck et al. D.E-5 (1952-1954) 1958 AO7 Central Thai AO7 Bang Chan

146 Table 11. Comparison of Calories and Nutrients Available to Groups A and B, with Each Other and with the Estimated Allowances

Average per capita per day

	Estimated amounts available[1]		Allowance	
	Group A	Group B	Group A	Group B
Food energy, calories	1731	2009	1935	1955
Protein, gm	50	59	59	59
Fat, gm	14	22	-	-
Carbohydrates, gm	342	384	-	-
Calcium, mg	129	194	650	650
Phosphorus, mg	847	895	-	-
Iron, mg	6.9	8.4	8.7	8.8
Vitamin A, I.U.	2047	1340[2]	2522	2548
Thiamine, mg	0.68	0.76	0.93	0.96
Riboflavin, mg	0.37	0.28	1.07[3]	1.06
Niacin, mg	11.3	11.5	9.3	9.6
Ascorbic acid, mg	27	23	24	24
Thiamine/calorie ratio	0.39	0.38		
Thiamine/non-fat calorie ratio	0.42	0.42		

1. Estimates based on values for edible portion without allowance for cooking losses. Analyses for a number of common foods were incomplete (See Table 13, p. 75).

2. No values found for flowers of Sesbania roxburghii, therefore these are not included.

3. Slightly higher allowance for Group A because of presence of one more nursing mother in this group than in Group B.

Average intakes of riboflavin were estimated to be about a third, or less, of the allowances. Estimates of calcium intake were, on the average, only 20% of the allowance for Group A, and 30% of that for Group B. Although the calcium allowances were thought to be conservative, estimated requirements based on calcium balance experiments are believed by some investigators to reflect usual intake rather than need, and the extent to which man may adapt to a low calcium diet is still undetermined. Among residents of Bang Chan, no evidence was noted other than short stature and small bones, which might suggest a calcium deficiency.

The vitamin A value of diets of both Groups A and B appeared to be low. Clinical signs possibly associated with vitamin A deficiency, i.e. xerosis and pharynoderma, occurred among residents of Bang Chan (Hauck, 1956), and as would be expected from the method of selection of the two groups, such skin signs were more prominent among members of Group A than Group B. On this basis one would expect the vitamin A intake of Group A to be less than that of Group B, whereas the reverse appeared to be the case on the survey days; but the higher estimated vitamin A value for the diets of Group A than Group B may not represent a real and consistent difference. The yellow (2)sa-(5)noo flowers, for which no nutrient values were found, were used rather liberally by some families in Group B at one season and may have contributed vitamin A value. Moreover, owing to unavoidable changes in the plan for alternating visits to the two groups of families, those in Group B were visited more often when the level of water in the canals was low and the leafy water plants were not available. The unusual intake of a large amount of yellow sweet potato by one family in Group A on one survey day may also have tended to distort the picture. Families in Group A, however, used substantial amounts of sweet basil leaves, whereas in Group B, this herb was used for seasoning only.

The estimated amount of thiamine available per capita, before cooking, was 73% of the estimated allowance for Group A and 79% for Group B. Since over four-fifths of the thiamine content of the foods used by each group came from rice, and the thiamine loss when rice is cooked as it was in Bang Chan has been estimated as 75% or more (Tuangraksatva and Srisukh, 1955) the actual per capita intake of thiamine must have been below the value of 0.23 mg. per 1000 calories which the Food and Nutrition Board, National Research Council (1953) considered to be the minimal requirement for adults. According to Nicholls (1951, p. 87), a ratio of Thiamine: Non-fat Calories of 0.3 - 0.35 is borderline and too low, and ratios below 0.3 are associated with beriberi-producing diets. That the diets of some of these people, as eaten, were in fact dangerously low in thiamine, is attested by the occurrence of beriberi and history of beriberi among them. Of the 15 persons, 20 years of age or older in Group A, 7 had knee jerk

196 absent, and in 6 of these, ankle jerk was absent also. In
164 Group B, the apparently better nourished group, one adult and two school boys had knee jerk only absent. In Group A, Household 12, the father, mother and 21 year old son all had both knee jerk and ankle jerk absent. The son was diagnosed by the examining physician as having frank beriberi at the time of the medical inspection. In Household 2, the father and 23 year old son had both knee jerk and ankle jerk absent, but the mother had no signs of thiamine deficiency. In Household 67, mother and father had both knee jerk and ankle jerk absent. The mother had lost 3 of her 6 children when they were 3 or 4 months old, with symptoms such as convulsions and voiceless crying, suggestive of infantile beriberi. When the third child died, the mother had symptoms of beriberi, and the physician who conducted the medical inspection considered the death of this child to be due to infantile beriberi. Clearly the thiamine content of diets of some of the families studied was inadequate to meet their needs under varying conditions of activity and stress. Beriberi was the one frank deficiency disease observed while these studies were underway in Bang Chan (Hauck, 1956).

196 Fat provided only about 9 to 10% of the calories. Coconut oil contains only about 0.5% of linoleic acid (Anantakrishnan, et al., 1949), but the essential fatty acid content of the diet as a whole was not estimated.

196 In summary, although the estimated nutrient intakes of
164 Group B were in general more favorable than those of Group A, the contrast between the two groups was not striking. Perhaps we should have anticipated this from the fact that the groups did not present a clear contrast in apparent nutriture. In Group A, 19 of the 30 persons examined had a total of 36 possible signs of nutritional deficiency. In Group B, 8 persons had a total of 9 such signs. Judging by both the apparent nutriture of the household members, and by their estimated nutrient intakes, the diets of both groups were in need of improvement.

146 Contribution of Food Groups and Certain Common Foods to the Nutritive Values of the Diets

[028] Contribution of Food Groups and Individual Foods. - The percentages of the total calorie and nutrient intakes provided by various food groups for households in Group A and B are shown in Table 12.

196 Rice and other cereals. - Rice was the staple food,
262 which provided over 4/5 of the calorie intake and more than half of the protein for both groups. Much of the difference in calorie and protein intake of the two groups was due to the greater rice consumption of Group B. Rice was also the

[Text continues on page 72 --- Analyst]

most significant source of phosphorus, iron, thiamine, riboflavin and niacin in these diets. Although the calcium content of rice is low[1], about 23 and 16% of the estimated calcium content[2] of diets of Groups A and B respectively came from the cereal groups. Glutinous rice and various products such as noodles made of rice flour were eaten occasionally in small amounts. These and other cereals and cereal products, such as wheat bread and popcorn contributed little to the total nutritive value of the diets.

Animal products other than pork fat. - Fish and other foods of animal origin furnished about 2/5 of the protein in the diets of both groups. From 20 to 30% of the riboflavin and niacin and substantial amounts of phosphorus and iron were provided by this food group, also. For families in Group A, these animal products provided substantially more fat than the group of fats and oils as such, whereas Group B obtained about the same amount of fat from these two food groups. The estimated contribution of vitamin A from this group was small. Specific analyses for most of the varieties of fish used in Bang Chan were not available, however, hence many calculations were made on the basis of average values for "fat fish," "lean fish," and "dried fish."

Although a substantial part of the calculated calcium content of the diets came from animal products, the amounts were only about 8 and 9% of the estimated allowances for Groups A and B respectively. Fermented fish are reported to contain 1126 mg. per cent of calcium (Knudson, 1955) but the amounts eaten were relatively small. Two families only in Group A used a total of 217 grams of fermented fish on survey days, and two families in Group B used a total of 608 grams. These amounts, though they represented servings of only 20 grams per person for the two families in Group A, and of 36 grams per person for those in Group B, nevertheless increased the estimated average calcium intakes substantially, so that 43% of the calcium in diets of Group A, and 34% in diets of Group B, were provided by animal products. The tiny dried fish which are eaten whole, were not used by the families studied on any of the 44 survey days.

On the average, the contribution of animal products other than fish to the nutrient content of these diets was small.

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[256] 1. According to Knudson (1955), addition of calcium carbonate to rice during the milling process was not practiced in Thailand.

[76] 2. No attempt was made to estimate calcium intake from betel chewing, although this might be considered a dietary source of calcium. Six of 15 persons twenty years of age or older, in Group A, were betel chewers, whereas among 14 persons over twenty in Group B, 9 chewed betel regularly and one occasionally.

[146] [262] Eggs were eaten occasionally; pork and beef were bought infrequently and in small amounts by some families. One family only, ate chicken; other meats eaten on survey days included buffalo, frogs, eels and field rats.

Vegetables. - More than three quarters of the estimated vitamin A value of these diets was provided by green and leafy vegetables, although the pale yellow sweet potatoes, eaten in quantity by one family in Group A increased the vitamin A from other vegetables substantially. The greater use of swamp cabbage, a wild aquatic plant by families in Group A, may be explained by the fact that more visits to this group occurred when the water level in the canals was relatively high. Families in Group B, however, used a greater variety [263] of greens, especially leaves from a number of trees. For families in Group A, sweet basil contributed substantially to the vitamin A and riboflavin content of the diets, whereas families in Group B used this herb in trivial amounts for flavoring. No nutrient values were found for lemongrass, which was used regularly in substantial amounts for flavoring. Persons in Group B got a greater percentage of their calcium and iron from green than from other vegetables, whereas those in Group A obtained as much or more of these nutrients from other vegetables.

Nearly 3/5 of the ascorbic acid intake of Group A was provided by other vegetables as compared to 1/4 from green vegetables, whereas Group B obtained about equal amounts of ascorbic acid from green and other vegetables. Egg plants[1], calabash and white radish were most commonly used in quantity. Onion, garlic and dried chilies were used daily, but in smaller amounts. With the exception of one family which ate a large amount of sweet potato on one survey day, consumption of tubers, i.e. sweet potato and taro, was small and usually in the form of snacks eaten by children. Legumes were seldom eaten in Bang Chan. Two families had bean sprouts on survey days, and children occasionally ate mungbeans and peanuts as snacks.

Fruit. - Although technically a fruit, the coconut does not resemble fruits as a group in its contributions to the diet, hence coconut and other fruits are treated here as two sub-groups. Coconut meat, and its products, coconut milk and coconut cream (Appendix C, p.120), were used almost daily in the participating households. These coconut products contributed about 1/5 of the total fat of the diet, for Group A,

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[244] [252] 1. Many varieties of eggplant are grown in Thailand. Three were used on survey days: the pea-size variety which was frequently put in hot curry, a round type which was served raw with chili sauce and a long variety which was either panned with a small amount of fat or used in curry.

146 more than fats and oils as such.
262

Bananas were grown by all families that participated in the study, but were eaten only occasionally, primarily as
[263] snacks. Tamarind and lime were used often in small amounts in making sour curry and chili sauce, and bergamot rind was used for seasoning. Papaya and mango, both of which are good sources of vitamin A and C, were each eaten once only during the survey. The green papaya was used in curry. Fruits are relatively abundant in Thailand, the year round, yet fruit made minor contributions to the diets of families studied in Bang Chan.

Fats and oils. - Fats were used in small amounts to pan fish, meat, eggs and vegetables, and provided about 1/7 of the total fat in the diet of Group A, and 2/7 for Group B. Coconut oil, which was less expensive than pork fat, was more often used in Group A.

Sugar. - Palm sugar was used in small amounts in the preparation of many "with-rice" dishes, and occasionally in snacks, i.e. guava dipped in a mixture of sugar, salt, chili, mung beans cooked in palm syrup and the like. The amounts used were small, and the contribution to nutritive value was slight. By Western standards, the consumption of sugar in Bang Chan was almost negligible.

146 Spices. - Spices were commonly used in food preparation,
263 particularly in hot dishes (i.e. those made with chilies) but little information on their nutritive value is available.

146 Alcoholic beverages. - In the families surveyed, all men
273 except the elderly father in Household 21 drank occasionally, but most of the women did not. The husbands in Households 12 and 67 drank heavily at times. No estimate can be made of the contribution of alcoholic beverages to caloric intake in these households.

146 Summary of Nutrient Contributions of Foods Commonly
262 Eaten in Two Groups of Households. - The contribution in terms
[128] of calories and nutrients of certain foods used by 25% or more of the families studied, i.e. by 3 or more of the families on at least one survey day is shown in Table 13. Items selected for inclusion in this table are those which either made significant contributions to the nutrient content of the diets of Groups A and B respectively, or were major items in terms of amounts used or frequency of use. For certain items used frequently for seasoning, information on nutritive value was too scant to warrant inclusion in this table. Figures given are for average consumption per capita per day, based on all persons in the specified groups, and all survey days. For items used by all or most families every day, such as rice, fresh fish, chili, coconut products, and sugar, the figures represent approximately the usual daily per capita consumption.

Table 13. Contributions in Terms of Calories and Nutrients of Selected Foods Commonly[1] Eaten by Groups A and B

Foods	Frequency[1] of Use	Average values per person per day											
		Wt.	Calories	Protein	Fat	Carbohydrates	Ca	P	Fe	Vit. A	B_1	Ribo.	Niacin	Vit. C
		gm		gm	gm	gm	mg	mg	mg	I.U.	mg	mg	mg	mg
Group A														
Rice		399	1440	28	3	316	28	634	3.5	(0)[2]	0.54	0.14	7.5	(0)
Eggs	9	4	8	1	1	0	3	8	0.1	48	0.01	0.01	0	0[2]
Fish, fresh	31	57	58	10	2	0	19	124	0.6	0	0.03	0.04	2.4	0
Fish, dried	8	6	12	3	0	0	4	2	0.2	0	0	0.02	0.2	0
Fish, fermented	2	2	2	0	0		19			0	0	0.01	0	
Fishsoy		5	2	0	0					0	0	0	0.1	
Shrimp paste	33	3	3	1	0					0	0	0	0.2	
Swamp cabbage	4	20	3	0	0	1	9	6	0.3	750	0.01	0.01	0.1	4
(2)Phag (2)ka-(2)cheed	4	3	1	0	0		6		0.1	204	0	0.01	0	2
Sweet basil		4	4	0	0	1	3	2	0.1	504		0.09		0
Calabash	3	11	2	0	0	0	1	2	0.1	8	0	0.01	0.1	1
Chili, fresh	17	4	1	0	0	0	0		0	126	0	0	0	8
Eggplants	10	13	3	0	0	1	2	5	0.1	4	0.01	0.01	0.1	1
Radish, white	5	7	2	0	0	0	0	6	0	1	0	0	0	1
Sweet potato	1	18	22	0	0	5	5	9	0.1	74	0.02	0.01	0.1	14
Banana	2	3	3	0	0	1	0	1	0	14	0	0	0	0
Coconut milk[3]	22	144	30	0	2	2								
Coconut oil		2	15	0	2	0	0	0	0	0	0	0	0	0
Lard		-	4	0	0	0	0	0	0	0	0	0	0	0
Sugar, palm		6	22	0	0	5	5	2	0.6	0			0	
Total			1637	43	10	332	104	799	5.8	1733	0.62	0.36	10.8	21
Total from all foods			1731	50	14	342	129	847	6.9	2047	0.68	0.37	11.3	27

See footnotes p. 76.

146 262 For items used less frequently, the figures are correspondingly less than the usual amount eaten. Thus, sweet potato, which is represented as 18 grams per day per person in Group A, actually appeared on 3 records only. One family of 8 persons ate 1200 grams of sweet potato at one meal and a substantial amount later the same day. Most items appear on the lists for both groups, but sweet potato, sweet basil and bananas were included on the list for Group A only, and glutinous rice which is used as a sweet in this area, appears on the list for Group B only. Note that a few common foods account for most of the nutrients in the diets of both groups. These common foods account for only about 80% of the calcium and vitamin A value and slightly less of the ascorbic acid in the diets of Group A. The list for Group B accounts for about 70% of the calcium and 60% of the ascorbic acid in the diets of this group. The variety of green leaves used once or twice only on survey days by Group B, and the number of different seasonal fruits used by both groups in small amounts as snacks, probably account for this.

264 [855] 262 Contribution of Snacks to the Nutrient Content of Diets. - On the average, 4 out of 5 children had one snack per day, whereas only one adult in 6 did so. The following items appeared most commonly: various kinds of fruit, 40 times (orange 7, banana 6, pineapple, watermelon and mango each 5 times, guava, jujube and Manila tamarind each 2 times, olives, rambutan, rambai, star gooseberry, (2)ta-(1)koo and Thai nutmeg each once,) coconut and bread each 13 times, glutinous rice 8, mung bean 7, truffles 6, products made of rice flour 6 times, and a variety of other items including rice noodles, sweet potato, taro, bean sprouts, lotus stalks, lotus seeds, popcorn, products made of cassava flour, sugar cane, pork and milk from 1 to 4 times each. Salt, and/or palm sugar were [146] eaten with a number of the snacks. Although they contributed only about 2% of the total calories, and from 1 to 3% of most nutrients, snacks contributed 16% of the total ascorbic acid for Group A and 11% for Group B.

Seasonal Variation in Food Preparation, Meal Patterns, Food Costs and Calorie and Nutrient Value of Foods Eaten

128 252 264 [435] In Table 14, a summary including the number of meals prepared, time spent in meal preparation, number of "with-rice" dishes, and cash expenditures for food is given by rounds, for families in each group.

252 512 [443] Number of Meals Prepared. - Food was cooked twice on each survey day in 3 of 6 households in Group A and 3 of 5 households in Group B. Heavy farm work or vending which kept the mother away from the house sometimes accounted for once-a-day food preparation. One housewife who took food to market in Bangkok, cooked food twice a day only during the period shortly before the birth of a child, when she was not vending.

[Text continues on page 79 --- Analyst]

252 Another, who had time during Round IV to prepare food twice a
262 day, preferred to prepare more in the morning when she expected
264 to offer food to her son who had just been ordained. In two
512 instances an evening meal was not prepared because the father
[525] and mother had been invited to a feast in connection with an ordination ceremony, on one occasion a mother did not prepare food because she was gambling. In all of these cases, the evening meal at home consisted of leftover rice and other foods prepared earlier. The housewife in Household 215 sometimes received cooked foods from visitors in return for her services as medium, and these were used, together with leftover foods, for the evening meal. The meal patterns of the two groups of families did not appear to differ greatly.

252 Time for Meal Preparation and Number of Dishes Prepared. - In general, the time for meal preparation varied with the number and type of "with-rice" dishes prepared. The "hot" dishes usually required more preparation time than the mild ones, because of the time required to pound spices, and to cut up ingredients. Once-a-day food preparation reduced the time required for cooking. More time was apt to be spent on food preparation when the housewife was least busy with farm work or other work outside the home. Some of the families visited early in Round I had not begun heavy farm work, and in some, children, who were less skilled, did the cooking.

262 Cost of Food Purchased. - The lowest cash expenditure
435 for food by any household on a survey day was 0.12 baht, for
511 a family in Group A, and the highest 16.24 bahts, for a household in Group B (Table 14, p. 78). On a per capita basis, however, the mean cash expenditure for food by Group A households, for all survey days, was slightly higher than for households in Group B (Table 8, p. 62), and no evidence was obtained that in general households in one group tended to spend more for food than households in the other. Despite the wide variation in cash expenditures for food on the survey days, the tendency for cash expenditures for food to decrease in both groups of households as the survey year pro-
262 gressed was apparent. Most of the rice was sold at the end
432 of Round III. The cash went for capital investments, not
[221] food, during Round IV. With time to drain ponds and to fish intensively, and with ceremonies to attend, people did not need to buy fish and meat which were relatively expensive.

146 Calorie and Nutrient Value of Foods Eaten. - The
221 seasonal variation in calorie and nutrient intake of the two
[128] groups of families is shown in Table 15. As one would expect, the average calorie intake was higher during Rounds I and III, when relatively heavy farm work associated with planting and harvesting was under way, than during Round II, which was primarily the growing season for rice, or Round IV, when the harvest was in, and the earth was dry so that preparation for the next planting had not yet begun. Greater consumption of rice in Rounds I and III was largely responsible for the

[Text continues on page 81 --- Analyst]

146 221 Table 15. Seasonal Variation in the Average per Capita Intake per Day of Calories and Nutrients by Two Groups of Households

	Family Group	Round[1] I	II	III	IV
Calories	A	1906	1560	1752	1708
	B	2262	1757	2156	1862
Protein, gm	A	53	44	48	55
	B	59	49	59	68
Fat, gm	A	15	15	14	13
	B	25	21	19	21
Carbohydrate, gm	A	382	302	349	334
	B	437	334	427	340
Calcium, mg	A	239	84	86	107
	B	243	181	223	128
Phosphorus, mg	A	953	782	734	917
	B	1033	737	960	851
Iron, mg	A	9.0	6.4	5.6	6.6
	B	7.7	7.1	12.5	6.1
Vitamin A, I.U.	A	4414	582	1392	1802
	B	1337	1939	1197	884
Thiamine, mg	A	0.86	0.63	0.59	0.63
	B	0.92	0.57	0.72	0.57
Riboflavin, mg	A	0.61	0.27	0.34	0.24
	B	0.43	0.24	0.27	0.25
Niacin, mg	A	13.2	11.1	9.2	11.8
	B	14.1	9.2	11.7	11.2
Ascorbic acid, mg	A	48	19	21	18
	B	15	45	21	15

1. For dates of Rounds, see Table 7, p. 58.

[146] [221] higher calorie intake in these periods. In general, the level of calories, phosphorus and thiamine and to some extent the protein varied with the rice consumption. The greater consumption of fish when fish ponds were drained during Round IV, accounted for the relatively higher protein content of the diets of both groups at this time, even though calorie intake was not at its peak. During this period, animal foods provided 45 and 53% of the total protein intake of Groups A and B respectively, whereas for the year as a whole, 37 and 40% of the protein intake of these groups was of animal origin.

The relatively high vitamin A and C intakes of families in Group A, during Round I as compared to other periods, was associated with a higher consumption of green leafy vegetables, and the use of sweet potatoes in quantity by one family. During Round II, families in Group A had few green vegetables, and their average intake of vitamin A was very low. The use of papaya, obtained as a gift, by one family in Group B during Round II raised the average ascorbic acid intake for this group substantially. Better average intakes, by one or both groups, of vitamin A, thiamine, riboflavin and calcium during the first Round, were not such as to provide liberal body stores to be called upon when food supplies of these nutrients were low.

000

SOME RECOMMENDATIONS FOR IMPROVEMENT OF DIET AND NUTRITURE AMONG RESIDENTS OF BANG CHAN

[164] Attempts to improve nutritional status in Bang Chan should be directed both toward increasing the supply and intake of certain nutrients and toward improvement of sanitary conditions so that intestinal infestation, diarrhea and other related illnesses will not lead to needless loss or increased requirement of nutrients.

Solution of the related problems of disposal of human excreta and provision of a year-round safe water supply are [164] in the province of the sanitary engineer. Intestinal para- [312] sitism was common, but little can be done through treatment of individuals so long as the water supply is contaminated. [271] Rain water was preferred for drinking, so provision of adequate and sanitary storage for rain water, coupled with sterilization of water from ponds and canals when rain water is not available, would do much to ensure safe drinking [846] water. The custom of giving mother and infant boiled water [353] only, during the post-partum rest period, provides a starting point for extending use of boiled water to other ages and conditions.

000 and conditions. An improved stove[1], by making more efficient [55] use of fuel, would reduce one obstacle to boiling drinking water. The alternative, chemical treatment, might be regarded as "medicine," and people might be more willing to spend money for this than for firewood. Water supply and latrine facilities at the school and wat should be such as to set a good example. Since links between sanitation and health have not been established in the minds of the villagers, no proposed solutions are apt to be effective without a strenuous and continued educational campaign.

Since the nutrient content of many foods used in Bang Chan has not been ascertained, the responsible Thai government personnel should as soon as possible seek to analyze those more commonly used, in particular fish, fermented fish, shrimp paste, fish paste and fishsoy, both commercial and home-made products, edible green leaves and flowers. Discovery, among the many varieties of fish used, of some which are good sources 146 of vitamin A, would be particularly useful. Of the calculated vitamin A values in diets for the two groups of households studied 90% or more of the vitamin A value was from vegetable sources, therefore in the precursor form. Among foods of animal origin which were used, eggs were the only food known to contain appreciable amounts of vitamin A. With more, and more complete, analyses of Thai foods, some of unusual nutritive value would probably be discovered. Also, information on composition of coconut milk should permit reasonably accurate calculation if the weight of coconut meat and the resulting product are known. Use of figures now available in food value tables, for coconut milks as prepared in Bang Chan, would lead to gross overestimate of caloric value and fat content of diets.

000 In using present knowledge to improve nutrient intake, emphasis should be placed on changes which would improve the everyday diet for all members of the family. We would start with familiar foods and methods of preparation, stressing the types of food which should be produced and used in increasing amounts. Advice of specialists in agriculture at nearby Kasetsart University should be sought in making choices appropriate to the location, among vegetables which would enhance the nutrient content of the diet, particularly in vitamin A value [246] and riboflavin. Since garden area is often limited, vine vegetables which can be trellised may be useful. In introducing innovations, we would, if possible, build on procedures known to be acceptable to some respected persons in the community.

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1. The "Hyderabad Smokeless Chula" would be useful in Bang Chan. In Smokeless Kitchens for the Millions, S. P. Raju (1953) includes designs for models with one to three cooking holes and hot water pot (The Christian Literature Society, P. O. Box 501, Park Town, Madras, India).

000 First steps toward a better diet are suggested by the best dietary practices observed. Although the calculated intake of no family on any survey day approximated or exceeded the estimated allowances for all nutrients, sharp contrasts were evident in individual records. Two sample calculations in Appendix C (pp. 121-122) represent one of the better and
262 one of the poorer records obtained. The food for Household
592 12, on Jan. 14, 1954 consisted chiefly of polished rice, fish, and non-leafy vegetable, with seasonings. In contrast, on July 23, 1953, Household 16 used home-milled rice, and about 60 gm. per person of swamp cabbage, with other vegetables and fish. These choices enhanced the potential nutritive value of the diet markedly without increasing its cash cost. Family labor was involved, however, in gathering greens and milling rice.

000 Since rice is the chief solid food for all ages, improving this major item will be considered first. An important step would be to teach the people to cook rice with just enough water so that all would be absorbed. The Thai government has sought to encourage this. So long as the practice
[252] [146] of cooking rice in excess water persists, much of its vitamin and mineral content will be discarded, and efforts to improve the nutrient content of rice will be largely nullified. Some rice water could be used as a beverage, and for cooking certain vegetables which are commonly served with a thickened sauce. This would be preferable to discarding the rice water, but encouraging its use must be considered as an alternative to cooking rice without excess water, since the two practices are mutually exclusive.

[146] [256] Use of under-milled and processed rice, and of the rice polishings, has the advantage that a large part of the original B-complex content is conserved, whereas vitamins for enrichment are at present imported, and are apt to be for years to come. Since home milling persisted to some extent in Bang Chan, it might be encouraged, in some families.
[256] [554] One highly respected headman continued to mill rice at home, hence the "prestige value" of white rice may not be so important in Bang Chan as it is among city Thai, who sometimes regard undermilled rice as "prisoner's food." The time and effort involved in home milling, however, may deter those who have given it up from returning to it; and since deepening the main canal has made the mill accessible to more families the year round, a program based on the assumption that commercial milling of rice will increase is probably more realistic than an attempt to encourage the return to home milling where it has been abandoned.

256 At present, no processed rice is made in Thailand. A plan to buy and install a Malekizing plant to process rice for the Royal Thai Navy was announced in 1953, but the plan has not materialized. Enriched rice has been sold by the Thai Rice Company for some years, but the best grades only,

256 90 to 100% unbroken grains, are used. To benefit rice farmers, enrichment should either be done at the nearby mills, or premix sold locally, and farmers taught to mix it with
• [146] their own rice. Because the premix used and marketed by the Thai Rice Company contains riboflavin as well as thiamine, niacin and iron, the treated grains can be readily distin-
000 guished from ordinary rice. Enrichment at the mill would be convenient, but would probably entail some government supervision and would not automatically ensure a better nutrient intake unless people learned the value of the conspicuous yellow grains. From this standpoint, separate purchase of premix might have advantage, at least in the initial stages of the program.

As far as we know, use of rice polishings in preparing "with-rice" dishes has not been explored in Thailand. Incorporation of rice polishings into a variety of soups and other "with-rice" dishes which would be acceptable to the Thai palate should not be difficult for the Thai home economist interested in experimental cookery. Nutrients usually lost in milling could thus be returned to the human diet. If adopted this procedure could be effective even in families that cling to the customary method of cooking rice in excess water. One old lady with beriberi, whose doctor had prescribed rice polishings, said she found them tasty. Information on the health value of rice polishings would probably be received more favorably if homemakers were shown acceptable ways of using them. A watery extract of the polishings might be used as a stop-gap preventive of thiamine deficiency while the slow process of changing food habits is going on. Such an extract could be used as a strengthening medicine for women during pregnancy and lactation, for infants and young children, and for those doing heavy field work, i.e. for vulnerable
[159] groups. The "second class doctors" at Minburi, the priests who practice healing, other traditional practitioners and midwives, because of their basic desire to help, would provide natural centers of information for this purpose.

Efforts being made by Thai government agencies to encourage eating more "with-rice" and less rice should be continued. A Thai co-worker suggested that "an educational program enjoining less peppery forms of with-rice would have the effect of encouraging consumption of a larger proportion
[262] of with-rice" (Sharp et al. 1953, p. 278). Various food items including those with a hot taste, were sometimes said to be bad for children, pregnant women, sick persons, etc., but seldom was any food mentioned as being good to eat under these circumstances. The concept that hot tasting foods are not healthful might be coupled with the idea that more generous amounts of mild dishes, especially those including green and
[262] yellow vegetables, should be used instead. The most widely used vegetables in Bang Chan were the wild swamp cabbage, and (2)phag (2)ka-(2)cheed, both leafy aquatic plants. Planting more (2)phag (2)ka-(2)cheed, and liberal use of both of these plants while they are available should be encouraged.

000 Growing other kinds of green and yellow vegetables should be fostered. Although vitamin A value and riboflavin content appear to be critical, in choosing vegetables to be stressed, specialists in agriculture should consider greens [P62] with high calcium and low oxalic acid content also. A variety of edible leaves of trees were used by a few families; some used sweet basil as a vegetable rather than just a seasoning; pumpkin and sweet potato were familiar, but less often used than would be desirable. More green or yellow vegetables which mature when canals are low and aquatic plants no longer available, would be especially good. If increased production by most households[1] is not practicable, a few of the more successful gardeners might be persuaded to produce vegetables and fruits which would help to bridge the gap between rainy seasons. Mushrooms, which can be grown readily, would provide a good source of ribo- [P64] flavin when leafy vegetables are in short supply. The boom-and-bust experience in mushroom culture (See Appendix A, pp. 101-102) might, however, make its revival as a source of healthful food for home use more difficult than if the villagers did not think of mushrooms as a cash crop for which the market failed.

Eating more fruit would help to tide over the dry 262 season. Fruits were commonly used as snacks, not at meal- [P66] time, hence snacks of fruit should be encouraged for adults as well as children. Bananas grew in all gardens and were available the year round. The (4)nam (4)waa variety, which was used in ceremonies, and considered safe for all, should 000 be stressed. More families could grow pineapple, which is [P77] relished both raw and in curries. Mango and papaya, fruits of outstanding value for both vitamin A and ascorbic acid, would be excellent, but the idea that growing papayas is "unlucky" must be taken into account. If a few of the more thoughtful and forward-looking farmers could be persuaded to start papaya trees, even though they were not willing to plant them near the house, the practice might spread in time.

• 146 On the average, the Bang Chan diet did not seem to be [P64] very deficient in protein, but distribution is not proportional to need, and protein deficiency may be in part responsible for periods of weight loss, or failure to gain, so 000 common among infants and children. The presence of other [P34] essential nutrients in animal foods is important also. If, the local supply of fish is indeed diminishing, efforts to [P22] increase it through pond culture should be continued. Abandonment of tilapia culture in Bang Chan, after about one-third of the families had tried it, (Appendix A, p. 101) suggests that not enough of the right kind of help was given

1. Tenant farmers may not be permitted to enlarge gardens by mounding at the expense of rice fields.

Table 16. Estimated Dietary Allowances for Residents of Bang Chan[1]

	Calories[2]	Protein[3]	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin[4]	Ascorbic acid
		gm	gm	mg	I.U.	mg	mg	mg	mg
Adult man (52 Kg)									
Active	2500	60	0.5	8	2500	1.2	1.0	12	25
Adult woman (47.3 Kg)									
Active	1900	55	0.5	10	2500	1.0	1.0	10	25
Pregnant (latter half)	2300	80	0.8	18	4000	1.2	1.5	15	25
Lactating	2900	85	1.0	15	4000	1.5	2.0	15	30
Adolescents									
Boys 15-19 years	3000	80	1.0	12	4000	1.5	1.5	15	30
13-14 "	2500	70	1.0	12	3000	1.2	1.2	12	25
11-12 "	2000	60	0.75	10	2500	1.0	1.0	10	25
Girls 13-17 "	2500	70	1.0	12	3000	1.2	1.2	12	30
11-12 "	2200	65	0.75	10	2500	1.0	1.2	10	25
Children 9-10 "	1700	60	0.75	8	2500	0.7	1.0	7	25
7-8 "	1600	60	0.75	7	2500	0.6	1.0	6	20
5-6 "	1400	50	0.5	6	2000	0.6	1.0	6	20
3-4 "	1200	40	0.5	6	2000	0.5	1.0	5	18
1-2 "	900	35	0.5	5	1500	0.4	1.0	4	15
under 1 year	80/kg	3/kg	0.5						

1. This table was modified from Dietary Allowances Under Tropical Conditions (Nicholls, 1951, p. 315)

2. Adjustment of calories was made for adult man and adult woman, taking age, body size, climate and activity into account (Food and Nutrition Board, 1953. pp. 3-7 and FAO Committee on Calorie Requirements, 1950, p. 22); 400 calories extra were allowed for late (obvious) pregnancy and 1000 calories extra for lactation. Nicholl's estimates have been accepted for children and adolescents.

3. Protein allowances for sedentary man and woman were chosen for adults.

4. Allowance for niacin is 10 x thiamine allowance except that 15 mg rather than 12 mg was used for pregnancy.

Table 17. Estimated Dietary Allowances for Persons in Two Groups of Households, Participating in the Dietary Study, Bang Chan, 1953-54

Age Group[1]	Number	Average Age	Calories	Protein	Calcium	Iron	Vitamin A	B_1	Riboflavin	Niacin	Ascorbic Acid
Group A				gm	gm	mg	I.U.	mg	mg	mg	mg
Men											
60+	1	63	2000	60	0.5	8	2500	1.0	1.0	10	25
50-59	2	51	4380	120	1.0	16	5000	2.2	2.0	22	50
40-49	1	41	2315	60	0.5	8	2500	1.2	1.0	12	25
30-39	2	35	4750	120	1.0	16	5000	2.4	2.0	24	50
25-29	-										
20-24	2	22	5070	120	1.0	16	5000	2.4	2.0	24	50
Women											
70+											
60-69	1	60	1570	55	0.5	10	2500	1.0	1.0	10	25
50-59	-										
40-49	2	46	3420	110	1.0	20	5000	2.0	2.0	20	50
30-39	1	34	1805	55	0.5	10	2500	1.0	1.0	10	25
	2		5610	170	2.0	30	8000	3.0	4.0	30	60
20-29	1	20	1945	55	0.5	10	2500	1.0	1.0	10	25
Boys											
15-19	1	15	3000	80	1.0	12	4000	1.5	1.5	15	30
13-14	-										
11-12	2	11.5	4000	120	1.5	20	5000	2.0	2.0	20	50
Girls											
13-17	1	13	2500	70	1.0	12	3000	1.2	1.2	12	30
11-12	1	12	2200	65	0.75	10	2500	1.0	1.2	10	25
Children											
9-10	4	10	6800	240	3.0	32	10000	2.8	4.0	28	100
7-8	3	8	4800	180	2.25	21	7500	1.8	3.0	18	60
5-6	2	5.5	2800	100	1.0	12	4000	1.2	2.0	12	40
3-4	1	3	1200	40	0.5	6	2000	0.5	1.0	5	18
1-2	1	1	900	35	0.5	5	1500	0.4	1.0	4	15

Table 12. Percentage[1] of Total Caloric and Nutrient Intakes Provided by Each Food Group

Food Group	Family group[2]	Calories	Protein	Fat	Carbohydrate	Minerals Ca	Minerals P	Minerals Fe	Vitamins A	Vitamins B1	Vitamins Ribo.	Vitamins Niacin	Vitamins C
Rice and other cereal	A	85	57	23	92	23	75	52	1	82	38	66	-
Home-milled rice		20	14	7	21	8	24	16	-	26	13	25	-
All other		65	43	16	71	15	51	36	-	56	25	41	-
	B	82	54	16	93	16	75	46	-	84	51	64	-
Home-milled rice		9	6	2	10	3	12	7	-	14	9	13	-
All other		73	48	14	83	13	63	39	-	70	42	51	-
Fish and other animal foods	A	7	37	40	-	34	18	15	4	7	21	28	-
	B	7	40	29	-	43	19	15	10	8	29	29	-
Green and leafy vegetables	A	1	2	1	-	14	1	8	79	2	31	1	25
	B	1	2	1	1	23	1	17	76	2	10	2	38
Other vegetables	A	3	3	3	3	15	5	13	15	7	8	3	58
	B	2	3	4	2	8	4	7	5	5	8	4	37
Coconut and products (other than oil)	A	2	1	18	1	-	-	-	-	-	-	-	-
	B	3	1	21	1	-	-	-	-	-	-	-	-
Fruit	A	1	-	1	1	3	1	2	2	2	2	1	17
	B	-	-	-	-	2	1	1	9	1	2	-	23
Fats and oils	A	1	-	14	-	-	-	-	-	-	-	-	-
	B	3	-	29	-	-	-	-	-	-	-	-	-
Sugar	A	1	-	-	2	4	-	9	-	-	-	1	-
	B	2	-	-	3	4	-	14	-	-	-	1	-
Miscellaneous and spices	A	-	-	-	1	7	-	1	-	-	-	-	-
	B	-	-	-	-	4	-	-	-	-	-	-	-

1. Figures rounded to nearest whole number. The dash indicates value less than 0.5%. Analyses for a number of common foods were incomplete (see Table 13, p. 75).
2. Group A included apparently less well nourished families, Group B, apparently better nourished families.

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Table 13, cont.

Foods	Frequency[1] of Use	Wt.	Calories	Protein	Fat	Carbohydrates	Ca	P	Fe	Vit. A	B_1	Ribo.	Niacin.	Vit. C
		gm		gm	gm	gm	mg	mg	mg	I.U.	mg	mg	mg	mg
Group B														
Rice		438	1579	30	3	345	29	654	3.7	(0)	0.56	0.15	7.4	(0)
Glutinous rice		8	30	1	0	7	1	12	0.1	(0)	0.01	-	-	(0)
Eggs	7	5	9	1	1	0	3	10	0.1	58	0.01	0.01	0	0
Fish, fresh	32	72	75	13	2	0	25	158	0.7	0	0.04	0.05	3.0	0
Fish, dried	10	12	22	5	0	0	7		0.3	0	0.01	0.03	0.5	0
Fish, fermented	2	4	5	1	0		46			0	0	0.01	0	
Fishsoy		3	2	0	0					0	0	0	0.1	
Shrimp paste	28	2	3	1	0					0	0	0	0.1	
Swamp cabbage	5	9	2	0	-	1	6	4	0.2	542	0.01	0.01	0.1	3
(2)Phag (2)ka-(2)cheed	2	3	1	0	0	0	6		0.1	198	0	0.01	0	2
Calabash	1	10	2	0	0	0	1	2	0.1	7	0	0.01	0.1	1
Chili, fresh	8	3	0	0	0	0	0		0	48	0	0	0	6
Eggplants	3	5	1	0	0	0	1	2	0	2	0	0	0	0
Radish, white	2	12	3	0	0	0	4	3	0.1	3	0	0	0	2
Coconut milk[3]	16	76	52	1	4	3								
Coconut oil		3	27	0	3	0	0	0	0	0	0	0	0	0
Lard		3	30	0	3	0	0	0	0	0	0	0	0	0
Sugar, palm		11	43	0	0	11	9	4	1.3	0			0.1	
Total			1886	53	16	367	138	849	6.7	858	0.64	0.28	11.4	14
Total from all foods			2009	59	22	384	194	895	8.4	1340	0.76	0.28	11.5	23

1. All items were eaten by 25% or more of the participating families. Under "frequency of use," the number of times the item was used as a main ingredient of a "with-rice" dish is indicated for 24 survey days for Group A and 20 survey days for Group B.
2. ( ) means imputed value; 0 means none or insignificant amount; - means no values available, but probably contains measurable amount; blank space means that no information was found.
3. Different values were used for the calculation of nutrient content of coconut milk for Groups A and B (see Appendix C, pp. 128-129).

Table 17. (continued)

Age Group[1]	Number	Average Age	Calories	Protein	Calcium	Iron	Vitamin A	B_1	Riboflavin	Niacin	Ascorbic Acid
				gm	gm	mg	I.U.	mg	mg	mg	mg
Group A											
Under 1 yr.	1[3]	1 mo.	720	27	0.5						
Total	32		61585	1882	20.5	274	80000	29.6	33.9	295	753
Round III[4]			61985	1907	20.8	282	81500	29.8	34.4	300	755
Round IV[4]			62585	1912	21.0	279	81500	30.1	34.9	300	758
Group B											
Men											
60+	1	64	2000	60	0.5	8	2500	1.0	1.0	10	25
50-59	1	53	2125	60	0.5	8	2500	1.1	1.0	11	25
40-49	3	46	6750	180	1.5	24	7500	3.3	3.0	33	75
30-39	1	39	2315	60	0.5	8	2500	1.2	1.0	12	25
25-29	1	25	2500	60	0.5	8	2500	1.2	1.0	12	25
20-24	3	21	7690	180	1.5	24	7500	3.6	3.0	36	75
Women											
70+	2	80+	2760	110	1.0	20	5000	2.0	2.0	20	50
60-69	-										
50-59	1	59	1570	55	0.5	10	2500	1.0	1.0	10	25
40-49	1	44	1710	55	0.5	10	2500	1.0	1.0	10	25
30-39	2	36	3610	110	1.0	20	5000	2.0	2.0	20	50
	1[2]		2805	85	1.0	15	4000	1.5	2.0	15	50
20-29	1	22	1930	55	0.5	10	2500	1.0	1.0	10	25

1. Based on age at beginning of the study.
2. Two nursing women (no. 922 and 905), age 30-39.
3. One additional infant in group, during Round IV.
4. One 20-year old woman (no. 525) was obviously pregnant in Round III and nursing mother in Round IV of the dietary survey.

Tabl 17. (continued)

Age Group[1]	Number	Average Age	Calories	Protein	Calcium	Iron	Vitamin A	B_1	Riboflavin	Niacin	Ascorbic Acid
				gm	gm	mg	I.U.	mg	mg	mg	mg
Group B											
Boys											
15-19	2	15	6000	160	2.0	24	8000	3.0	3.0	30	60
13-14	2	13	5000	140	2.0	24	6000	2.4	2.4	24	60
11-12	1	12	2000	60	0.75	10	2500	1.0	1.0	10	25
Girls											
13-17	2	15.5	5000	140	2.0	24	6000	2.4	2.4	24	60
11-12	-										
Children											
9-10	3	10	5100	180	2.25	24	7500	2.1	3.0	21	75
7-8	3	8	4800	180	2.25	21	7500	1.8	3.0	18	60
5-6	2	6	2800	100	1.0	12	4000	1.2	2.0	12	40
3-4	2	4	2400	80	1.0	12	4000	1.0	2.0	10	36
1-2	1	2	900	35	0.5	5	1500	0.4	1.0	4	15
Under 1 yr.	1[3]	3 mo.	240	5	0.5						
Total	37		71965	2154	23.75	321	93500	35.2	38.8	352	876
Round III[4]			72365	2179	24.05	329	95000	35.4	39.3	357	376
Round IV[4]			72965	2184	24.25	326	95000	35.7	39.8	377	881

1. Based on age at beginning of the study.
2. One nursing woman (no. 752), age 30-39.
3. One additional infant in group, during Round IV.
4. One 38-year old woman in Group B (no. 732) was obviously pregnant in Round III and was a nursing mother in Round IV of the dietary survey.

Table 18. Average per Capita Dietary Allowances for Persons in Two Groups of Households Participating in the Dietary Study, by Round and for the Year, Bang Chan, 1953-54

	Calories[1]	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm	gm	mg	I.U.	mg	mg	mg	mg
Group A									
Round I	1925	58.8	0.64	8.6	2500	0.93	1.06	9.2	24
Round II	1925	58.8	0.64	8.6	2500	0.93	1.06	9.2	24
Round III[2]	1937	59.6	0.65	8.8	2544	0.93	1.08	9.3	24
Round IV[2]	1956	59.7	0.66	8.7	2544	0.94	1.09	9.3	24
Average per capita	1936	59.2	0.65	8.7	2522	0.93	1.07	9.3	24
Group B									
Round I	1945	53.2	0.64	8.7	2527	0.95	1.05	9.5	24
Round II	1945	58.2	0.64	8.7	2527	0.95	1.05	9.5	24
Round III[2]	1956	58.9	0.65	8.9	2568	0.96	1.06	9.6	24
Round IV[2]	1972	59.0	0.66	8.8	2568	0.96	1.08	9.6	24
Average per capita	1955	58.6	0.65	8.8	2548	0.96	1.06	9.6	24

1. Adults were considered to be "active." The estimates therefore represent values intermediate between those appropriate for heavy farm work, during planting and harvesting, and the relative inactivity of the intervening periods.

2. One 24-year old woman in Group A and one 38-year old woman in Group B were obviously pregnant in Round III, and they were both nursing mothers in Round IV of the dietary studies. Young infants were not counted separately in Round IV, as they were receiving mothers milk only.

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Dietary Study, Bang Chan - Nutritive Value of Total Foods Eaten in 24 Hours — Household No. 16 — Date: July 23, 1953 — Persons Eating: 8

Raw Ingredient	Adj. cons.	Calories	Protein gm.	Fat gm.	Carb. gm.	Ca mg.	P mg.	Fe mg.	Vit. A I.U.	B_1 mg.	Ribo. mg.	Niacin mg.	Vit. C mg.
Rice, home milled	3877	14074	295	43	3036	426	8568	46.5	(0)[1]	7.37	1.94	120.2	0[1]
Dried fish	450	864	189	7	0	293		11.3	0	0.27	1.40	20.7	0
Bottle gourd	1535	261	9	3	58	184	276	9.2	1075	0.61	0.77	15.4	154
Swamp cabbage	480	139	14	1	26	350	245	12.0	30240	0.34	0.58	3.4	154
(2)Phag (2)ka-(2)cheed	40	11	1	0	2	66		1.2	2400	0.04	0.08	0.3	28
Coconut milk[2]	1010	935	8	59	42								
Pork fat	36	325	0	36	0	0	0	0	0	0	0	0	0
Fishsoy	48	23	2	2					0	0.01	0.04	1.1	
Shrimp paste	16	19	4	0					0	0	0.02	1.0	-
Chilies, dried	20	49	3	1	6	32	74	0.5	115	0	0	0	10
Garlic	16	15	1	0	4	7	21	0.2	0	0.04	0.01	0.1	2
Bird pepper	10	3	0	0	1	2	-	0.1	600	0.01	0	0	20
Onion	4	1	0	0	0	1	2	0	2	0	0	0	1
Lime	4	2	0	0	1	(2)	(1)	(0)	0	(0)	(0)	(0)	1
Palm sugar	25	96	0	0	24	20	10	2.9	0	0	0	0.3	0
Salt	20	0	0	0	0	46	0	0.1	0	0	0	0	0
Total		16617	526	152	3200	1429	9197	84.0	34432	8.69	4.84	162.5	370
Average/cap.		2077	66	19	400	179	1150	10.5	4304	1.09	0.60	20.3	46

1. ( ) means imputed value; 0 means none or insignificant amount; - means no values available, but probably contains measurable amount; blank space means no information found.
2. See Appendix C, pp. 128-129.

2: Haugk et al. D.E-5 (1952-1954) 1958 AO7 Central Thai AO7 Bang Chan

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Dietary Study, Bang Chan - Nutritive Value[1] of Total Foods Eaten in 24 Hours — Household No. 12 — Date: Jan. 14, 195[illegible] — Persons Eating:

Raw Ingredient	Adj. cons.	Calories	Protein gm.	Fat gm.	Carb. gm.	Ca mg.	P mg.	Fe mg.	Vit. A I.U.	B_1 mg.	Ribo. mg.	Niacin mg.	Vit. C mg.
Rice, polished	1335	4806	91	9	1053	80	1869	10.7	(0)	1.60	0.40	20.0	(0)
Egg plant	370	89	4	1	20	56	137	1.5	111	0.15	0.19	2.2	19
Fat fish	152	275	28	18	0	56	321	1.5	0	0.09	0.06	6.1	0
Lemongrass	36												
Holy basil	24	23	2	0	4	19	2	0.7	3024	-	0.55	-	1
Lime	22	8	0	0	3	9	5	0.1	0	(0.01)	0	0	6
Bird pepper	7	2	0	0	0	1	-	0.1	402	0	0	0	13
Shrimp paste	6	6	1	0	0				0	0	0.01	0.3	
Palm sugar	6	21	0	0	5	4	2	0.6	0			0.1	
Garlic	4	4	0	0	1	2	6	0	0	0.01	0	0	1
Total		5234	126	28	1086	227	2342	15.2	3537	1.86	1.21	28.7	40
Average/cap.		1745	42	9	362	76	781	5.1	1179	0.62	0.40	9.6	13

1. ( ) means imputed value; 0 means none or insignificant amount; - means no values available, but probably contains measurable amount; blank space means no information found.

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Foods for Which Values Were Obtained from Miscellaneous Sources, or Imputed by the Authors

Name of Food	Source or Basis for Imputed Values
Cereals	
Rice, glutinous, black	Values for glutinous rice
Animal Foods	
Fermented fish	Values from Thai table; vitamin analysis for FAO by Hoffman-La Roche, Ca value from Knudson (1955).
Shrimp paste	Values from Thai table; vitamin analysis for FAO by Hoffman-La Roche.
Fishsoy	Values from Thai table; vitamin analysis for FAO by Hoffman-La Roche.
Field rats	Values from Chatfield et al. for mammals, dressed.
Fruits	
(2)Ma-(1)dan, fruit	Leung et al. Unspecified fruits, tropical areas.
Manila tamarind	Leung et al. Unspecified fruits, tropical areas.
Ranbai	Willimott
Thai nutmeg	Values for persimmon
Vegetables	
(1) Bauaun	Values for eggplant
Bergamot rind	Aykroyd et al., values for lime peel.
Celery leaves, Chinese	Values for celery leaves and stalks, Chinese.
Coral	Leung et al., values for dark green leaves
Cucumber	Watt et al., for figures for Fe and Vitamin A in cucumber with skin.

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Galangal	Leung et al., values for ginger root.
(1)Jauau	Leung et al., values for dark green leaves.
(3)Khii-(2)leg	Leung et al., values for dark green leaves.
(4)Khlyb	Leung et al., values for dark green leaves.
Lotus stalk	Leung et al., values for lotus root.
(2)Ma-(1)dan leaves	Leung et al., values for dark green leaves.
(4)Ma-(5)khya (2)khaj (2)taw	Values for eggplant.
Morinda	Leung et al., values for dark green leaves.
(2)Phag (2)ka-(2)cheed	Leung et al., values for dark green leaves.
Sweet potato	Chatfield, values for vitamin A in pale variety.

Foods for Which Nutritive Values Were Not Calculated and the Total Amounts Eaten by Two Groups of Households Throughout the Survey

Name of food	Amounts Eaten	
	Group A	Group B
	g	g
Bergamot leaves	5	15
(2)Ka-(1)chaaj	15	71
(2)Kha-(1)cauaun flowers	25	0
Lemongrass	135	154
(2)Sa-(5)noo flowers	216	1078

NOTES ON THE PREPARATION AND NUTRITIVE VALUE OF COCONUT MILK AND COCONUT CREAM

252 The term coconut cream ((5)hua (2)ka-(4)thi), as it
262 was used in Thailand, referred to the product which was made by squeezing grated coconut with little or no addition of water. Coconut milk ((4)naam (2)ka-(4)thi) was made by squeezing grated coconut repeatedly with water. Coconut cream might be made first, and the residue extracted one or more additional times to obtain coconut milk. The terms coconut milk and coconut cream apparently are not used consistently. Losee (1952) commented on this when he described
[114] [171] the preparation of coconut cream in Samoa, and said that it was sometimes called coconut milk. Miller et al. (1936), in describing the preparation of coconut milk said "If a thick coconut milk to serve over puddings, taro leaves, etc. is desired, 1/2 to 3/4 cup of coconut water or boiling water should be poured over 3 cups of grated coconut. . . . If the milk is to be used in curry sauce for chicken, eggs, shrimps, or in cornstarch pudding, a larger quantity of water (1 to 2 cups of water to 3 cups of grated coconut) may be used."

126 In carrying out the dietary study, the observer weighed the grated coconut meat, the residue and the final products, coconut milk or cream, or both. She did not weigh the water as it was added in successive portions, but the amount of added water could be calculated.

184 The ratio of coconut milk to meat varied considerably,
262 but on the average, households in Group A obtained coconut milk which weighed more than eight times as much as the coconut meat from which it was made. Households in Group B obtained less than 2½ times as much milk by weight as coconut meat. The number of extractions made varied from 2 to 6,
146 with a mode of 3. Obviously, the products made by Groups A
171 and B, although both called coconut milk, had markably differ-
262 ent percentage composition, and neither was similar to "coconut milk" for which values could be found. These values were as follows:

		Coconut milk grams per 100 gm. E. P.		
Authors	Location	Pro.	Fat	Carbo.
Bocobo et al.	Philippine Islands	3.6	33.2	38.4
Food and Drug Division	Thailand	3.52	34.75	1.52
Miller et al.	Hawaii	4.0	27.0	18.9[1]

1. Personal communication

128 In calculating values to be used in our estimates of
146 nutrient content of diets in Bang Chan, we made two assump-
262 tions: 1) that the "expressed coconut milk" described by Miller et al. was similar to coconut cream as made in Bang Chan, and 2) that coconut milk as made in Bang Chan differed from coconut cream primarily by dilution. When coconut milk was made by successive extractions after coconut cream had been prepared, the combined weights of cream and milk were taken to represent the yield of coconut milk from the weight of meat used.

The ratio of coconut cream to coconut meat was approximately the same, 0.30 for households in Group A and 0.33 for those in Group B, but Group A used more water in making coconut milk than Group B. By calculation, we obtained the following figures for the percentage of protein, fat and carbohydrate in coconut milk as made in the two groups of households.

Estimated Composition of Coconut Milk as Made in Two Groups of Households, Bang Chan

	Grams per 100 gm. E. P.		
	Protein	Fat	Carbo.
Group A	0.15	1.0	0.7
Group B	0.5	3.6	2.4

The need for a guide for calculating composition of various coconut milks, based on actual analysis of the products as made at home is apparent. Since coconut milk was used almost daily in Bang Chan, use of the figures which we found in the literature would have introduced a major error into our calculations. Using figures from the table designed for use in Thailand (Food and Drug Division, Bangkok, 1953), the average per capita caloric intake per day, from this source for the families studied would have been over 300 calories, as compared to about 45 calories, using the figures calculated on the basis of observed precedures in the village.

/Pp. 130-139 contain no data on Bang Chan and the Central Thai and were not processed for the AO7 Central Thai file./

3:Hauck et al. D-5 (1952-1954) 1959 AO7 Central Thai AO7
Bang Chan

SUMMARY

129 Information on health, care, and diet of mothers and small
125 children in Bang Chan, Thailand, was obtained primarily by interview, although some direct observations were made. In general, three areas of inquiry were included in this study: 1) clinical history, especially such information as might have a bearing on the nutrition and health of the child, 2) food intake at various periods, and 3) cultural customs and ideas of interest in relation to the Cornell Thailand Project.

In all, 66 mothers of young children were interviewed. Information on diet during pregnancy, postpartum, and lactation was obtained from women who were either in the stage under discussion or had only recently passed through it.

The description of child feeding practices is based on records obtained concerning 57 children from birth to two years of age, a majority of whom were visited from 5 to 7 times.

Information on growth in height and weight is based on observations made on 71 children, most of whom were weighed and measured 6 or 7 times. Observations were made for 30 of these children both before and after weaning.

843 During pregnancy most women in Bang Chan continued to eat as usual. A few expressed cravings for certain foods, and a minority thought some kinds of food should not be eaten during pregnancy.

846 During the postpartum rest period most women ate a very restricted diet. Rice and fish, with salt, were the foods considered by all informants to be appropriate for this period.

853 As a rule, diet during lactation, after the mother resumed her usual work, was the customary family diet. A minority of informants mentioned foods which should not be eaten by a nursing mother.

164 Evidence of the need to improve diets in this region was
• 446 provided by the occasional occurrence of beriberi or the history of beriberi among mothers as well as by medical inspection and family dietary studies.

853 Breast feeding was the rule in Bang Chan. For a majority of infants observed, breast feeding was continued into the second year, and some were breast fed for more than two years. Few received animal milk after weaning.

about the same as the 3rd percentile of male infants in the U.S.A., and from one year on the values fell below the 3rd percentile. Norms for American children are inappropriate for use with Thai, but an increasing lag in growth such as we observed may be a matter for concern.

Weight Loss and Failure to Gain. - Many of the children in Bang Chan failed to gain or actually lost weight over periods of time. This occurred frequently between two weighings which were 1 to 4 months apart and occasionally when a child was reweighed after an interval of 6 months. In some children loss of weight or failure to gain extended over two weighing intervals. Such loss or failure to gain may be an important sign of malnutrition (Jelliffe, 1955).

Relation to age. - The ages at which the children experienced weight loss or failure to gain were determined by inspection of the weight-age graphs. As shown in Table 17A, a period of loss of weight or stationary weight was noted for only one child below the age of 6 months. Between the ages of 6 and 12 months, a time when healthy infants usually continue to grow rapidly, such periods of weight loss or failure to gain for intervals of 1 to 5 months between weighings were observed in almost 40 per cent of the infants. Dr. Montri (1939) and Dr. Amara (1957) did not discuss the growth of individual infants, hence we do not know to what extent failure of some infants to gain weight may account for the depressed growth, on the average, which both of these observers reported for infants of this age.

During the second year of life children may be expected to gain weight less steadily, but more than 40 per cent of the children of this age in Bang Chan lost weight or failed to gain over intervals of 1 to 7 months.

After 2 years of age approximately one-half to two-thirds of the children weighed in a given 6-month period lost or failed to gain weight. Of 68 children who were weighed and measured over a period of a year or more, only 16 did not experience such loss or failure to gain between any two weighings. Most of these were in the youngest age group, only 3 were over 2 years old at the end of the study.

Possible reasons for failure to gain. - From the information available specific reasons cannot be given for the loss or failure to gain weight of so many of the young children of Bang Chan. Infection may have played a role, although we saw little evidence of severe infection and it was seldom mentioned. Increased activity as children grow older might affect rate of gain at the toddler age. For safety very young children in Bang Chan were closely tended which meant that their activities were rather restricted. As they became older and learned to

[See p. 37 - Analyst]

145 In summary, although infants and children in Bang Chan
12.1 increased steadily in weight, the rate of increase tended to be less than that of infants observed in a well baby clinic in Bangkok and much less than is usual for Western infants.
• [146] Repeated periods of failure to gain in weight, or even weight loss, which we observed in infants and small children as well as in school children 7 to 14 years of age, may be evidence of unsatisfactory nutrition and might account in large part for the relatively small size of adults in this area. Extended longitudinal studies on growth of Thai children are needed, as are studies of food intake, intestinal parasitism, and other conditions which may lead to growth failure. Controlled therapeutic trials would help in recognizing the more serious of many problems of child health in this region.

[p 48 is blank]

BANG CHAN

among children in Bang Chan is not known. One thing which residents of Bang Chan appeared to have in common with other populations which have been reported to be relatively caries free, was low intake of sugar, particularly in a form which would be apt to adhere to the teeth.

Adults up to 44 years of age, in the random sample, retained most of their teeth. A few adults in Bang Chan have had missing teeth crowned. More sound than missing teeth were found to be crowned, however, i.e. in this community a crowned tooth appears to have cosmetic value.

A variety of serious illnesses were found to occur among residents of Bang Chan. As a rule, local traditional practitioners were consulted first, but most persons reported to have been seriously ill eventually received treatment by outside practitioners with some training in modern medicine.

The majority of mothers in childbirth were attended by local traditional midwives, but a few difficult cases were taken to the government Health Center in the nearby town of Minburi, where a trained midwife was in attendance.

Of 436 pregnancies reported by 84 mothers, over 90% resulted in live births. Of the 397 living children born to these women, 81% survived at the time of interview. Within the first month of life, 7% had died, and a total of 11% died within the first year. Tetanus was prominent among causes of death of infants under one month of age. Infantile beriberi caused some deaths among older infants. In a majority of cases, the cause of death of infants could not be clearly identified, but fever, debility and convulsions were the symptoms most commonly described.

Almost half of the persons examined for possible signs of nutritional deficiency, 40% of the school children and 47% of the family sample, were free of such signs. The remainder, slightly more than one half of persons examined, had from 1 to 7 signs each. In general, more of the children and adolescents than the adults were free of possible signs of malnutrition, and the larger percentages of persons with 2 or more signs were in the groups of older persons examined. Signs most often noted, namely changes in tongue, lips, skin and hair, and absence of knee and ankle jerk, might reasonably be associated with apparent deficiencies of riboflavin, vitamin A and thiamine in the diet. The only clearly defined deficiency disease observed among residents of Bang Chan during the field study was beriberi.

Hemoglobin values of 11.5 g or less per 100 ml. were

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As noted by the Joint FAO/WHO Expert Committee on Nutrition (1951) the part played by diet in the production of teeth which are unduly susceptible to caries is still controversial, although in general, the importance of nutrition, especially in the formative period, is widely accepted. In accordance with the recommendation of this Committee, caries rates are recorded as a separate item, and are not taken as a criterion of malnutrition.

Dentition. - Median ages of eruption of specific permanent teeth in 240 Bang Chan children, ages 7 to 14, are shown in Table 20 (Appendix B). For this purpose, data on 226 children in the Bang Chan primary school, and 14 additional children between those ages, in the random sample, were included. The percentage of boys and girls at each age, having each specific tooth erupted, was calculated. Median ages of eruption were estimated according to the method suggested by Klein et al. (1937). A graph was drawn for each kind of tooth, for each sex. Cumulated percentages for each specified kind of tooth erupted were represented on the x axis and age in years at one year intervals on the y axis. Median age of eruption was estimated by determining the point at which the age percentage eruption curve cut the 50% perpendicular.

In Bang Chan, as elsewhere, the median age of eruption for specific teeth is lower for girls than for boys. In some cases the difference is slight, in others, from several months to more than a year. The difference is most marked for lower canine teeth.

The average number of teeth, deciduous, permanent and total, at each age, is shown for children 7 to 14 years of age, in Table 21 (Appendix B). For ages 8 to 13, the greater dental maturity of girls than boys is reflected in the larger average number of permanent teeth present at each age.

On the basis of median ages of eruption for specific teeth, and the number of permanent teeth per child at each age level, dental maturity of children in Bang Chan appeared to be approximately the same as for children in other regions, in both eastern and western hemispheres, with which they were compared. Although the average number of teeth at some ages was lower for children in Bang Chan than for American or English children, the differences were neither marked nor consistent (Kamalanathan, 1956).

Caries Incidence. - Caries incidence was found to be low among Bang Chan children as compared to many regions in which surveys have been made. Of 226 children examined by the dentist, 42% (45% of the boys and 38% of the girls) were totally free of caries. When all carious teeth, both deciduous and permanent, were included, the average number of carious teeth per child was 1.8 (1.6 for boys and 2.0 for girls).

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164 Considering deciduous teeth only, in a group of 171 children, 93 boys and 80 girls who had deciduous teeth, 36% of the boys and 50% of the girls were free from caries. The average number of carious deciduous teeth per child was 1.4 and 1.5 for boys and girls respectively. For those with caries experience, the number of carious deciduous tooth per child was 3.2 for both boys and girls.

In the entire group of 226 children, 76% of 116 boys and 60% of 110 girls were free from caries of permanent teeth. The average number of carious permanent teeth per child was 0.5 for boys and 0.9 for girls. For children with caries experience, the figures were 1.9 and 2.3 for boys and girls respectively. None of the 30 boys with caries of permanent tooth had more than 4 such teeth, whereas 5 of 43 girls had more than 4 carious permanent teeth.

164 171 Data for children aged 12 to 14 in Galesburg, Illinois and Colorado Springs (Dean et al. 1942) have been chosen for comparison of caries experience in permanent teeth, with that in Bang Chan. In these cities, the fluoride content of the water is conducive to low caries incidence, yet the percentage of children aged 12 to 14 having caries experience was 72.2 and 71.5 for Galesburg and Colorado Springs, respectively as compared to 41% for Bang Chan, and the number of DMF[1] permanent teeth per child was 2.36 and 2.46 as compared to 0.88 carious permanent teeth per child in Bang Chan.

The reason for the relatively low incidence of caries among children in Bang Chan cannot be stated with certainty. Similarly low or even lower caries incidence has been reported for certain age groups of children in various parts of the world, for example in North China (Afonsky, 1951), in the northern islands of Samoa where the people had little access to store foods (Losee, 1952) and in a small isolated village in Greece [146] (Phillipas, 1955). One thing which residents of Bang Chan appeared to have in common with such other populations which are relatively caries free, was low intake of sugar[2], particularly in a form which would be apt to adhere to the teeth.

757 Restoration of Decayed and Missing Teeth. - None of the children examined had any filled teeth. Up to 44 years of age, the adults examined had retained almost all of their teeth, and [145] no evidence of restoration, other than crowning was noted. Decline in average number of teeth was marked after age 55.

Of 92 adults with teeth, at least 7 men and 6 women had been to a dentist as evidenced by the presence of crowned teeth

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1. DMF denotes decayed, missing and filled. Children in Bang Chan had no filled teeth.

2. Sudsanah (1956) found the average per capita intake of sugar in 11 families to be only 6 grams per day.

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757 in their mouths. More than half of the teeth crowned were said to have been sound, and no crowned molars were noted. The services of a dentist appear to have been sought more for their cosmetic value than for dental care as such.

276 164 Betel Chewing and Dental Health. - Betel chewing was not habitual with any of the adults under 25 years of age who were examined. Among adults above this age in the random sample, 13 of 29 men, or 45%, and 34 of 40 women, or 85% chewed betel. The group of adults from 25 to 44 years of age was singled out for study of caries incidence in relation to betel chewing, since adults retained most of their teeth up to this age. Among 19 betel chewers, 3 persons had 5 defective teeth whereas among 19 non-betel chewers, 7 persons had 46 defective teeth. Others (Gerry et al. 1952; Shouric, 1948) have reported a lower incidence of caries among betel chewers than non-chewers. Caution must be used in interpreting our observations, however, because the sample is small, and the teeth were not cleaned before counting caries. Stain and calculus may have obscured small caries in betel chewers.

The impression was gained by casual observation that protruding incisors were common among habitual betel chewers, and that the teeth of some betel chewers appeared to be loose. Since such protruding incisors were not noted among the school children, nor among non-chewers, we associated them with habitual betel chewing. Both Gerry et al. (1952) and Balendra (1949) noted a higher incidence of gingivitis among betel chewers than non-chewers. Since most of the older persons in our sample chewed betel, our data offered no clue as to the possible effect of betel chewing on the loosening and loss of teeth among older persons. Another item of possible importance, and on which we have no data, is the extent to which tobacco is used as an ingredient of the mixture which is spread on betel leaves.

276 146 Platt (1945) considered betel chewing as a potential source of calcium in the diet. He stated that the amount and utilization of calcium ingested with 6 betel leaves was similar to that from 10 ounces of cow's milk.[1]

The amount of calcium ingested in this way doubtless varies not only with the frequency of betel chewing, but also with the amount of juice swallowed. In Bang Chan, spitting out the juice appeared to be more customary than swallowing it.

276 Further research is needed to decide whether the potential disadvantages of betel chewing outweigh its potential benefits. Moreover in any attempt to decrease the practice of betel

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1. Platt, 1945. Footnote, p. 21.

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Table 9

147 Hemoglobin Values of 104 Residents, Age 15 and Older, in Random Sample, Bang Chan, 1952-53

	Number of Persons	Hemoglobin, grams per 100 ml.					
		Under 9.75	9.75-11.5	11.75-12.5	12.75-13.5	Over 13.5	Not Ascertained
Male	48	0	3	7	9	28	1
Female	56	1	13	10	14	11	7
Total	104	1	16	17	23	39	8

146 125 Occurrence of Possible Signs of Malnutrition. - Most of the signs and symptoms included on the schedule for clinical examination were those known to be of value in the assessment of nutritional status (Joint FAO/WHO Expert Committee on Nutrition, 1951). Some items included need to be investigated more fully before their value can be determined. Among the 146 164 items on the schedule, (Appendix A) the following were not observed in any of the persons examined:

Eyes: photophobia, lachrymation, blepharitis, xerophthalmia, Bitot's spots, gross corneal vascularisation.

Face: Folliculosis, nasolabial seborrhea, dyssebacia, suborbital pigmentation.

Lips: Scars of cheilosis and of angular stomatitis.

Tongue: Edema, color change to scarlet or magenta. (In 30 adults, however, such color changes if present would have been obscured by the discoloration from betel chewing.)

Gums: Retraction, loss of interdental papillae.

Parotid glands: Enlargement.

Skin: Perifollicular congestion, petechiae.

Edema

Calf tenderness

Inability to rise from squatting A [see p. 51-Analysis]

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In addition, the two cases of symmetrical dermatosis observed were not of the pellagroid type and should probably not have been included with the possible signs of nutritional deficiency.

The only instance of thyroid enlargement noted (an obvious thyroid adenoma) was in a 13 year old boy who had always lived in Bang Chan. He knew of no one else in the family with such enlargement.

Five girls and women in the random sample refused to permit the examining physician to palpate the liver and spleen, but he was able to carry out the rest of the inspection.

Almost half of the groups examined, 46% of the school children and 47% of the family sample, were free of the possible signs of nutritional deficiency. The remainder had from 1 to 7 such signs. Persons in the random sample were grouped according to age, and the percentage of each group found to have each number of signs is shown in Table 10. Note that most of the

Table 10

Number of Possible Signs of Nutritional Deficiency Occurring in 166 Individual Residents in the Family Survey, Grouped According to Age

Age Group, years	Number of Persons Examined	Percentage of Each Group Found to Have Each Number of Signs			
		0	1	2	3 or more
6 and under	33	54	3	3	0
7-14	34	47	38	9	6
15-19	17	76	18	6	0
20-39	41	32	54	7	7
40-59	27	7	33	22	37
60 and over	14	21	7	21	50
Total Group	166	47	30	10	13

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preschool children were free of signs. In general, more of the children and adolescents than the adults were free of possible signs of malnutrition, and the larger percentages of persons with 2 or more signs were in the groups of older persons examined. Among the children, a larger proportion of school children than preschool children or adolescents had possible signs of malnutrition; i.e., more than half of the children 7-14 years of age, as compared to 6% of the children 6 years old or under, and 24% of the age group 15 to 19 years.

The incidence of specific signs among school children and persons in the random sample of families, is summarized in Table 22 (Appendix B).

Several points concerning the distribution of specific signs possibly associated with nutritional deficiencies deserve comment. The most prominent group of signs among school children were the skin signs: xerosis which occurred in 15% and phrynoderma in 5% of the children. Even loss of elasticity of skin occurred in 3 boys. Among adults, these signs were confined almost wholly to the group of older women.

Liver enlargement was next in frequency among school children, with 5% of them exhibiting this sign. We have no evidence as to the cause of liver enlargement. It is sometimes associated with protein deficiency, but our data on food intake (Sudsanoh, 1956) is on the basis of family consumption, hence we do not know whether school age children have relatively low intakes of total protein or of animal protein. Liver enlargement may also be associated with intestinal parasitism, which was common in Bang Chan.

Dry, "staring" hair was observed in 18 children. One case of diminution of pigment was recorded. A number of other cases in which dark hair had an auburn cast, were noted by the non-Thai nutritionist, but were accepted as normal hair color by the Thai physician.

Ulcers on the legs below the knees were observed in 14 school children. Such ulcers, though not associated with any specific nutritional deficiency, occur commonly in ill-nourished subjects (Smith, 1952).

Some school age children both in the random sample and in Bang Chan primary school, did not have knee and/or ankle jerk. These signs were more prominent among adults, however, particularly among men, than in the school age group.

The occurrence of skin changes among older women, together with the higher incidence of low hemoglobin values among women than among men, accounts for the seemingly higher incidence of possible signs of malnutrition among adult women than men. The only clear difference in occurrence of signs among

[See p. 67-Analyst]

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• 146 164 women of childbearing age as compared to older women, was in the incidence of skin changes. Certain of these, i.e. xerosis, loss of elasticity and atrophic skin, were observed, in the adult group, only among older women. In some cases at least these signs may have been associated with aging rather than nutritional deficiency, unless, indeed some of the common signs of aging prove to be due to long continued intakes which are suboptimal. Among the school children, however, these skin changes were clearly abnormal.

At the clinical examination, redness of the gums was noted in a few cases only among school children, most of whom were examined in November. The dentist, who examined the children in February, noted redness of gums in about one-fourth of them. This difference may reflect a difference in standards used by the physician and dentist, or the incidence of this sign may have increased between examinations.

Certain groups of signs tended to occur together. Thus the various skin signs: phrynoderma, xerosis and loss of elasticity were often associated. Of 23 cases with absence of knee jerk, 16 had absence of ankle jerk also, and the various changes in tongue and lips not only tended to occur together, but these were often associated with absence of knee jerk and/or ankle jerk. The signs of possible nutritive deficiency most commonly noted, namely changes in tongue, lips, skin and hair, and absence of knee and ankle jerk, might reasonably be associated with apparent deficiencies of riboflavin, vitamin A and thiamine in the diet (Sudsaneh, 1956).

146 142 Bowleggedness was observed in a larger proportion of adults than children, but according to our criteria, did not occur in either group to the extent that we had been led to expect from previous reports. Among the 198 school children in Bang Chan who were examined by a physician in 1948-49, 69, i.e., about 35%, were reported to have bowed legs, with 4 cases called "severe" (Sharp et al. 1953, p. 249). Among the 233 children in Bang Chan school when we examined, 9 only, i.e., less than 4%, were considered bowlegged according to our criteria, and none of these cases was severe. Chutima (1939) stated that "Another condition prevalent in Siam and fundamentally due to improper diets since infancy is Bow-leggedness. Only about 25% have normal lower limbs, the rest being bowlegged and many are knock-kneed . . . The percentage of extreme bow legs is about 20% while mild bow legs form about 55% of our school children." Since these other observers determined bowleggedness by casual inspection[1], some of the difference between the earlier observations and ours may be due to difference in criteria used. The children

1. Personal communication from Dr. Yong Chutima.

146 pictured as bowlegged in Chutima's report (1939) are, however,
142 clearly so, and represent more extreme cases than we encountered among the children in Bang Chan in 1952-53. If the incidence of bowleggedness among children in Thailand is indeed decreasing, an investigation into possible causes of the change would be of interest.

142 To the nutrition specialist on the team, who was not Thai, the knee joints appeared to be large. Moreover, although the term "knock knees" was not included on the schedule, it was entered frequently by the physician under comments (Appendix B, [516] Table 22).[1] Whether this condition is related to heredity, nutritional status, or to some other environmental influence such as the life-time habit of squatting on the heels, is not known.

146 The physician's estimate of general appearance and vitality were recorded early in the examination, before he sought for specific signs. About 80% of all persons examined were rated as "good," and less than 1% as "poor." About half of all persons rated as "good" in general appearance and vitality were without clinical signs, as compared to about 30% of those rated "fair." Of persons with 3 or more possible signs of malnutrition, however, about 2/3 were rated "good" (Appendix B, Tables 23 and 24).[1] As has been observed frequently, such a general appraisal is not correlated with the presence or absence of clinical signs possibly associated with malnutrition. Clearly, in Bang Chan, there is little or no malnutrition of the sort that causes marked apathy.

In summary, a variety of possible signs of malnutrition were noted both in the school children and the persons in the random sample of village households. More than half of the total number examined had one or more signs possibly due to malnutrition, but the only clearly defined deficiency disease encountered was one case of beri beri[1] in a 49-year old man.

Reproductive Function in Females

84 Menstrual History. - Information concerning menstrual
125 history was obtained from girls and women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied.

145 Most of the women from whom information on age at menarche was obtained were under 40 years of age. A few could

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1. History of beriberi among nursing mothers and their
[114] infants was obtained in several instances, and cases of beriberi, in both sexes, were seen among persons not included in the population samples which were examined.

A [see p. 71-Ans.] B [see pp. 72, 73-Analysis]

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145 not recall the age at menarche.

The median and modal reported age at menarche was 15 years, with a range from 13-19 years (Table 11).

Table 11

Reported Age at Menarche of 54 Females in Bang Chan.

	Age in Years						
	13	14	15	16	17	18	19
Number at each age	6	18	34	21	8	4	3
Percentage at each age	6	19	36	22	9	4	3

This estimate, made from ages given by recall, is necessarily approximate; however, none of the girls between 12 and 14 who were examined clinically, had passed the menarche. Moreover, median and modal ages at menarche were 15 years for sub-groups aged 15 to 24, and 25 to 39 at the time of inquiry, hence the inclusion in this series of women for whom the event was not recent did not alter the estimated median age at menarche. Wilson and Sutherland (1953) conclude that in tropical countries the onset of menstruation as compared with that for English children, 145 may be either early or late. Tanner (1955) notes that if 114 climate has an effect on age at menarche, it must be a minor one, 121 and that at present the effect of race cannot be disentangled from nutritional and socio-economic circumstances. Basing his judgment on the effects on men of famine associated with war, [146] and on results of direct experiments on animals, Tanner expresses the conviction that nutrition plays a major role in determining the age at which menarche and the adolescent spurt in growth occur. If this view is correct, the relatively late median age of menarche in Bang Chan may be associated with inferior nutritional status.

145 One of 17 women in the age group 35-44 had passed the menopause, whereas 12 of 16 women over 45 years of age had done so. One of 7 women over 55 years of age, 2 of 7 women age 50-54, and one of 2 women age 45-49 had not yet reached the menopause. The reported ages at menopause were: 30-34 years, 2 women; 40-44 years, 3 women; 45-49 years, 3 women and 50-54, 5 women.

147 Approximately 100 respondents gave information concerning

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145 Deaths of infants a few days old, with a description of lockjaw, inability to suck, stiff back and clenched hands, were recognized as due to tetanus. The common practice of native midwives is to place the cord over a hard rhizome or clod of earth and to cut it with a tapered piece of bamboo. Thus, infection with the tetanus organism may occur from contact with the soil. Note that 12 of 26 deaths reported for infants under 1 month, were diagnosed as tetanus or probably tetanus. Zimmerman (1931) summarized important causes of death in Siam, based on the physician's diagnosis made after symptoms were described by the head of the household. Of 1800 deaths which occurred in the 18 months preceding the survey, 2% were diagnosed as tetanus. For the Central area, 3.8% of 495 deaths were from tetanus. Most, if not all of the cases of infantile tetanus could be prevented if native midwives learned to avoid contact of the cord with earth or a soil-coated rhizome. By using sterile scissors for cutting the cord instead of tapered bamboo which must be pressed against another surface to accomplish the cutting, contact with soil could be avoided. Of 335 household heads interviewed, 220 owned scissors of some kind (Nalis, 1955).

Infants several months old, who had some of the symptoms of infantile beriberi, as convulsions and almost voiceless crying, were considered as cases of infantile beriberi only if the mother had symptoms of beriberi, such as numbness or tingling in the extremities, or difficulty in walking, at the time. One mother had lost 3 infants at 3 or 4 months of age, with similar symptoms, but described the symptoms of beriberi in herself at the time of the death of the last baby only. The other two cases were therefore listed as convulsions, cause unknown. The occurrence of infantile beriberi reflects the unsatisfactory nutriture of the mother, whose milk is therefore low in thiamine content. To prevent deaths from infantile beriberi, the general level of nutrition in the village, and particularly the food habits of pregnant and nursing women, should be improved.

Note also the number of deaths from "debility." As the Joint FAO/WHO Expert Committee on Nutrition (1951) has pointed out, the number of early deaths from "congenital debility" becomes insignificant where the health and nutritional status of pregnant women approaches the optimal.

Intestinal Parasitism and Bowel Habits

126 Intestinal Parasitism. - All school children were provided with tin containers labelled with their names, and asked 125 to bring a stool sample to school. Fourth grade children 164 whose first stool samples were negative, were asked to bring a second specimen. Parasites were found in some of these second

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specimens. In all, specimens were obtained from 189 or 81% of the children and of these 32% were negative. In 128 stools containing parasites, 196 infecting organisms were found, or an average of 1.5 per infected child. Protozoa and helminths which are pathogenic or which may cause severe diarrhea were identified 126 times, and harmless forms 70 times. Of the harmful forms, Ascaris lumbricoides was found in 96 or 51% of the stool samples, Giardia lamblia in 19, or 10%, and hookworm, Endamoeba histolytica, Trichuris trichiura and Diphyllobothrium in 2% or less. Of the harmless forms noted, Endamoeba coli was found in 45 specimens or 24%, Iodamoeba williamsi in 21 or 11%, Endolimax nana and Chilomastix mesnili each in less than 2%. Doubtless the extent of intestinal parasitism in these school children was greater than the figures indicate, since some cases would be missed in examination of single stool specimens collected in this way. One might expect intestinal parasitism to be relatively common, also, among other family members.

Bowel Habits. - In connection with the clinical survey, persons examined were asked whether they had "constipation" or "diarrhea" frequently, occasionally, or never, i.e. not within the past 6 months. As the physician phrased the questions concerning "constipation," the replies indicated whether the respondent had daily bowel movements ("never constipated"), or usually had a bowel movement each day ("occasionally constipated") or usually had longer intervals between bowel movements ("frequently constipated"). Replies are summarized in Table 17.A

Considering the inadequate sanitation in Bang Chan, and the prevalence of intestional parasitism, the fact that 3/4 of the persons questioned said they "never" had diarrhea, is worthy of note. Most persons who reported having diarrhea were troubled occasionally rather than frequently. The fact that nearly 2/5 of those questioned had bowel movements less often than once a day, is not surprising in view of the fact that diets which are relatively low in fibrous foods and in the B complex vitamins frequently result in sluggish behavior of the large intestine. That approximately 3/5 of the respondents in Bang Chan usually had a daily bowel movement is perhaps more noteworthy. Even in areas where diets tend to be much more liberal, some persons usually have bowel movements at intervals of 2 or 3 days or even longer. If such persons have stools of normal character and experience no discomfort, this bowel habit may be considered normal for them.

A [see p. 43 - Analyst]

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Table 17

Bowel Habits of Persons Questioned in Bang Chan, Thailand, 1952-53

Group	Number of Persons Reporting	Frequency of Bowel Movements			Frequency[1] of Diarrhea		
		Daily	Usually 1/day	Usually longer intervals	F	O	N
		%	%	%	%	%	%
Random Sample of village Households	158	57	11	32	2	19	79
Primary school children	233	53	3	44	2	26	72
Total respondents	375[2]	54	7	39	2	23	75

1. F - Frequent; once a week or oftenor.
O - occasional; less often than once a week.
N - never; not within the past 6 months

2. Primary school children in random sample counted once only. Information not obtained in a few instances.

Table 22

•446 Summary of the Occurrence of Clinical Signs Possibly Related to Nutritional Deficiency, Bang Chan

	Random Sample of Families[1]							School Children[1]	
	Adults		Children						
	M	F	15-19 M	15-19 F	7-14 M	7-14 F	under 6 yrs.	Boys	Girls
Total number of persons examined	37	45	9	8	16	18	33	119	114
Clinical Signs									
Hb 11.5 g. or less/100 ml.	2	14	-	-	1	3	-	10	11
Hair - dry and staring	-	-	-	-	1	2	-	9	9
- diminution loss of pigment	-	-	-	-	-	-	-	-	1
Eyes - excess conjunctival tissue	3	6	-	-	-	-	-	-	-
Lips - cheilosis	-	-	-	-	-	-	-	1	1
- angular stomatitis	1	2	-	-	-	-	-	1	2
Tongue - papillae atrophied	-	1	-	-	1	-	-	1	1
- papillae hypertrophied	2	1	-	-	-	-	-	2	3
- appearance, fissured	1	1	-	-	1	-	-	2	-
- appearance, geographical	-	1	-	-	1	-	-	3	-
- NA Betel[2]	(8)[2]	(22)[2]	-	-	-	-	-	-	-

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Table 22 (cont.)

	Random Sample of Families[1]							School Children[1]	
	Adults		Children						
			15-19		7-14		Under		
	M	F	M	F	M	F	6 yrs.	Boys	Girls
Gums - swelling	-	-	-	-	-	1	-	2	2
- redness	-	1	-	-	1	1	-	2	3
- recession	-	-	-	-	-	-	-	-	1
Thyroid enlarged	-	-	-	-	-	-	-	1	-
Skin - Symmetrical dermatosis	-	-	-	-	1	-	-	1	1
- pityroderma	-	-	1	-	-	-	-	5	6
- xerosis	-	2	-	-	-	2	-	24	12
- loss of elasticity	-	7	-	-	-	-	-	3	-
- atrophic	-	6	-	-	-	-	-	-	-
- ulcers	-	-	-	-	1	1	-	8	6
Knee jerk absent	11	2	1	-	2	2	(5)[2]	-	3
Ankle jerk absent	9	2	1	-	-	1	(6)[2]	-	2
Liver enlarged	1	(2)[2]	-	(1)[2]	1	(2)[2]	1	14	7
Spleen enlarged	-	(2)[2]	-	(1)[2]	-	(2)[2]	-	-	1
Skeleton - bowed legs	13	13	1	-	2	-	2	8	1
- knock knees[3]	-	1	-	1	1	-	-	10	6

1. Eighteen children in Bang Chan primary school were also in the random sample of village families.
2. Not ascertained.
3. The term "knock knees" was not included in the schedule, but the figures are included here because it was mentioned so frequently under comments.

Table 23

146 Relation of Number of Possible Signs of Nutritional Defiency to Vitality Ratings of School Children, Bang Chan

Vitality Ratings	Number of Persons	Number of Persons With Each Number of Clinical Signs						
		0	1	2	3	4	5	6 or more
Poor	2		1	1				
Fair	48	13	22	9	2		1	1
Good	182	95	58	24	3	2		
Not ascertained	1			1				
Total	233	108	81	35	5	2	1	1
Percentage of persons with each number of signs		46	35	15	4 (3 or more)			

Table 24

W6 Relation of Number of Possible Signs of Nutritional Deficiency to Vitality Ratings of Persons in the Random Sample of Village Households, Bang Chan

Vitality Ratings	Number of Persons	Number of Persons With Each Number of Clinical Signs						
		0	1	2	3	4	5	6 or more
Poor	1		1					
Fair	30	11	10	5	4			
Good	121	55	37	12	8	5	3	1
Not ascertained	14	12	1					1
Total	166	78	49	17	12	5	3	2
Percentage of persons with each number of signs		47	30	10	13 (3 or more)			

7: Janlekha X-4,5 (1948-1953)p956 AO7 Central Thai AO7
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TABLE 15

VILLAGE PADDY CONSUMPTION
Bangchan, Thailand, 1953

Item	Units of Consumption	Rate	Total Consumption
		tang	tang
Food	1,372 man equivalent	38.3	52,548
Feed	5,066 chicken equiv.	4.0	20,264
Seeds	7,682 rai equivalent	1.0	7,682
Total		--	80,494

7: Janlekha X-4,5 (1948-1953)p956 AO7 Central Thai AO7
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In Table 15, units of consumption of paddy are arrived at by the following procedure:

1. Food. Children age 14 and under are considered to have one-half of the rate of consumption of adults and the old. Thus, 644 children in Table 2 comprise 322 man equivalent units of consumption. When 1,050 people over 14 years of age, each having one man equivalent unit of consumption, are added, a total of 1,372 units is obtained.

The rate of consumption of 38.3 tang per man equivalent was obtained from our consumption study of 106 families in 1953.

2. Feed. Due to the lack of adequate data for 1953, figures obtained by the poultry survey conducted in 1949 were used in the calculation for feed. Items in that survey include roosters, hens, chicks, and ducks. Information on poultry feed consumption was obtained from Luang Suwan, the poultry expert of Kasetsat University, Bangkok, who gave the following figures: roosters, hens and ducks, naturally raised, consume four tang of paddy per head per year; and a chick's paddy consumption, negligible at the beginning but gradually increasing with its age, is about three tang per year. Most of these chicks were disposed of at the age of seven months when each had consumed about one tang. One chicken equivalent is therefore assigned to each head of roosters, hens and ducks, and one-fourth chicken equivalent to each chick. On the basis of a stock of 17 chicken equivalents per family, which was found to be the case in 1949,

7: Janlekha X-4,5 (1948-1953)1956 AO7 Central Thai AO7
Bangchan

TABLE 16

ESTIMATED VILLAGE PADDY SURPLUS
Bangchan, Thailand, 1953

Paddy Production			193,594 tang
Paddy Consumption			
As food		52,548	
As feed		20,264	
As seeds		7,682	
Sub-total			80,494 tang
Paddy Surplus			113,100 tang

7: Janlekha X-4,5 (1948-1953)1956 AO7 Central Thai AO7
Bangchan

Other Food Production

235 433 Other food products which are produced in a considerable amount in Bangchan include chicken eggs, duck eggs, and fish. To a lesser extent, fruit and vegetables are also produced locally.

Practically every family in Bangchan raises chickens, and half raise ducks. In April, 1949, the author conducted a poultry survey covering 46 families whose homes were on the banks of Bangchan Canals. Of these, 45 families were found to be raising chickens and 23 families raising ducks.

Of 45 families raising chickens, 38 families from which data were available reported rates of egg production showing that for these families 53,750 eggs were produced annually from 376 laying hens, averaging 143 eggs per hen. [146] [438] Of 31 families who gave information about sales, five consumed all 2,260 chicken eggs produced; the other 26 families sold 31,040 eggs and consumed 5,590. The proportion of consumption to sale was thus 7,850 to 31,040 or approximately one to four.

There were 393 laying hens in the yards of 45 families, averaging 8.6 hens per family. Chicken egg production was estimated at 1,230 per family. Assuming that four-fifths [434] of these were sold at three for one baht, which was the local price in 1949, average cash income for these families from sale of chicken eggs was estimated at 326 baht annually. [435] With a higher price in 1953 of fifty satang a piece, the estimated income from sale of chicken eggs rose to 492 baht per family.

226 made that any program of fish raising in a closed pond, no
654 matter how effective it may be, should not preclude the need for conservation of fish naturally existing in the open canals.

243 It has been pointed out that Bangchan operators
226 produce 52 per cent of the things they need for ordinary
433 consumption. Thus, rice growing may be seen as a farming-
434 to-reduce-cost enterprise where maximization of profit ceases to be the primary motive of production. It has been pointed out also that rice growing is a losing concern to many operators (in terms of labor income and operator's labor earnings), but the loss has been compensated by the privilege to fish [146] which is open to all village residents. Since the amount of fish caught constitutes the main and probably the only source of protein intake and at the same time a considerable share in the diet of villagers, continually decreasing supply of fish therefore underscores the immediate need for an effective program for fish conservation as a means to prevent the standard of living of the villagers from falling below the minimum level of subsistence.

161 Over-population in an area of limited job opportuni-
464 ties naturally creates an over supply of labor, which in
465 turn results in low wages. This is further complicated by a wide variation of individual earning from labor of from two thousand baht annually to almost nothing, the latter being the case of transient members of farm operating families.